



Regular Payload Series

Hardware Installation Manual

Corresponding models: TM5 Series

Original Instruction

Hardware Version: 3.1

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Release Date: 2019-06-02

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Revision History Table

Revision	Date	Revised Content
1.00	2019-04-02	Original release
1.01	2019-06-02	Updated figures and minor context.

1. Product Description

1.1 Product Description

The TM Robot is a six-axis robot with power and force limiting function, which features simple programming, innovative integrated vision capabilities together with the latest safety functionality.

1.2 How Can I Get Help?

You can access information sources on the corporate website:

<http://tm-robot.com/>

Related Manuals

This manual covers the hardware installation, operation and user maintenance of TM Robot. See the following table for additional available manuals.

Manual Title	Description
Safety Manual	Contains safety information for TM Robots.
TMflow	Instructions for use of TMflow software.
TMvision	Instructions for use of TMvision software.

Table 1: Manual Title & Description

2. Safety Information

2.1 Overview

The user shall read, understand and abide by the safety information provided in this manual before using the TM Robot.

2.2 Warning and Caution Symbols

The Table below shows the definitions of the warning and caution levels described in each paragraph of this Manual. Pay close attention to them when reading each paragraph, and observe them to avoid personal injuries or equipment damage.



DANGER:

Identifies an imminently hazardous situation which, if not avoided, is likely to result in serious injury, and might result in death or severe property damage.



WARNING:

Identifies a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, and might result in serious injury, death, or significant property damage.



CAUTION:

Identifies a potentially hazardous situation which, if not avoided, might result in minor injury, moderate injury, or property damage.

Table 2: Warning and Caution Symbols

2.3 Safety Precautions



DANGER:

This product can cause serious injury or death, or damage to itself and other equipment, if the following safety precautions are not observed.


- All personnel who install, operate, teach, program, or maintain the system must read the “Hardware installation Manual”, “Software Manual”, and “Safety Manual” according to the software and hardware version of this product, and complete a training course for their responsibilities in regard to the robot.



Read Manual and Impact Warning Labels

- All personnel who design the robot system must read the “Hardware installation Manual”, “Software Manual”, and “Safety Manual” according to the software and hardware version of this product, and must comply with

all local and national safety regulations for the location in which the robot is installed.

- The TM Robot shall be used according to its intended use.
- Results of the risk assessment may require the use of additional risk reduction measures.
- Power to the robot and its power supply must be locked out and tagged out or have means to control hazardous energy or implement energy isolation before any maintenance is performed.
-  Dispose of the product in accordance with the relevant rules and regulations of the country or area where the product is used.

2.4 Validation and Liability

The information contained herein neither includes how to design, install, and operate a complete robotic arm system, nor involves the peripherals which may affect the safety of the complete system. The integrators of the robot should understand the safety laws and regulations in their countries and prevent major hazards from occurring in the complete system.

This includes but is not limited to:

- Risk assessment of the whole system
- Adding other machines and additional safety mechanisms based on the results of the risk assessment
- Building appropriate safety mechanisms in the software
- Ensuring the user will not modify any safety-related measures
- Ensuring all systems are correctly designed and installed
- Clearly labeling user instructions
- Clearly marked symbols for installation of the robot arm and the integrator contact details
- Collecting all documents into the technology folder, including the risk assessment, and this manual



CAUTION:

This product is a partly complete machine. The design and installation of the complete system must comply with the safety standards and regulations in the country of use. The user and integrators of the robot should understand the safety laws and regulations in their countries and prevent major hazards from occurring in the complete system.

2.5 Limitations on Liability

Even if the safety instructions are followed, any safety-related information in the Manual shall not be considered as a guarantee that the product will not cause any personal injury or damage.

2.6 General Safety Warning

1. The actual noise measured in a factory setting is about 49.3 dB under without production. (Condition: leave machine body 1m distance and at 1.6m height from the floor and 80% of maximum speed). If the sound

pressure is over 80 dB(A) while operating, wear proper ear protection.

2. Environmental Conditions:

- Ambient air temperature: 0°C ~ +50°C
- Ambient relative humidity: < 85%
- Transportation & Storage condition: -20°C ~ +60°C
- Transportation & Storage humidity: < 75%
- The robot needs to be protected from shock or vibration
- Observe ESD precautions when installing or removing robot

2.7 Risk Assessment

Before installing or using this product, the user must first carry out the necessary risk assessment based on the conditions of use; meanwhile also closely study the potential remaining risk addressed by the Corporation. Refer to and abide by the relevant chapters in Safety Manual in accordance with its' software and hardware version.

2.8 Emergency Stop

If any accidents occur during the operation of the robot, the user can stop all movement by pressing the Emergency Switch. When the robot stops, the user must ensure that all fault conditions are eliminated before manually restarting the robot. The Emergency Switch is only used in critical conditions. To stop the robot during normal operations use the Stop Button on the system controller. When the user presses the emergency switch, the TM Robot product will disconnect the power of robot and activate the brake after the robot motion is stopped. The indication light ring of the robot will not display light, and the three lights from the robot stick will be constantly blinking.

Once the risk assessment has been conducted, if an Emergency Switch needs to be installed the selected device must comply with the requirements of IEC 60204-1. Emergency Stop act, factory reset and any other circumstances, refer and abide by the relevant chapters in Safety Manual in accordance with its software and hardware version.

2.9 Movement without Drive Power

Robot without Drive Power could be found in three circumstances: Emergency stop, when disengaging packaging posture to initial booting, and power loss. The first two could enter Safe Start up Mode by means of releasing the Emergency Switch; the latter one is when robot loses external power. Regarding how to operate as well as safety precautions refer and abide by the relevant chapters in the Safety Manual.

If the robot loses power, and joints need to be moved in order to clear error conditions, you will need to release the brake for each joint as follows:

1. Remove joint cover screws (M3, Torx-T10) and joint cover.

2. Release the brake by pushing the pin on the brake solenoid shown in the following figures.

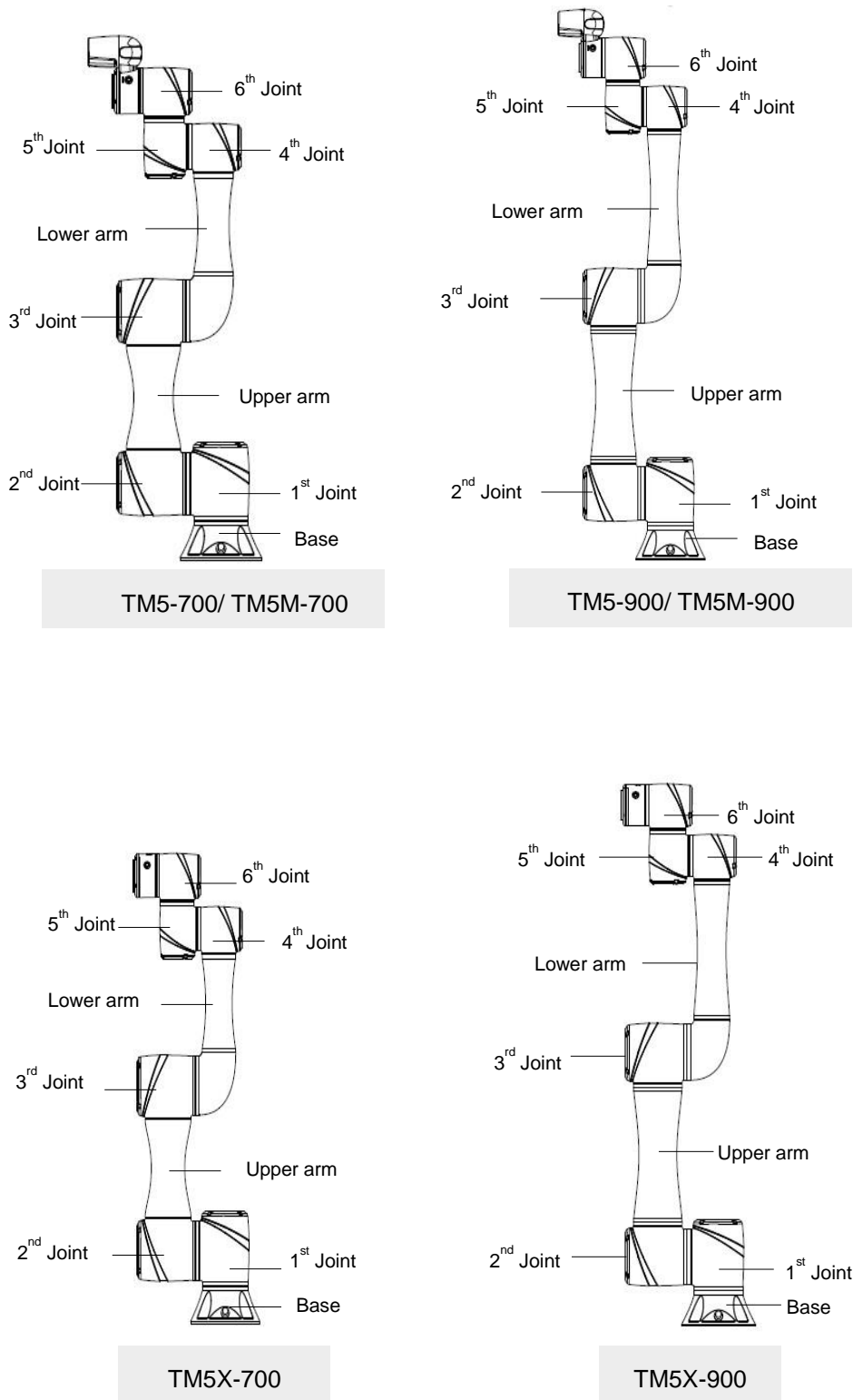
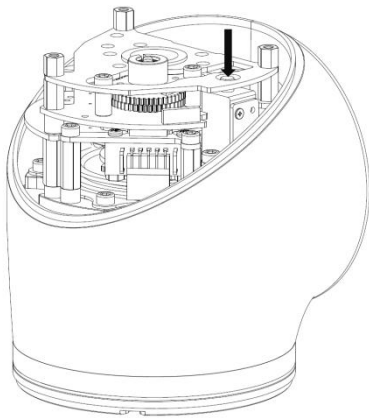
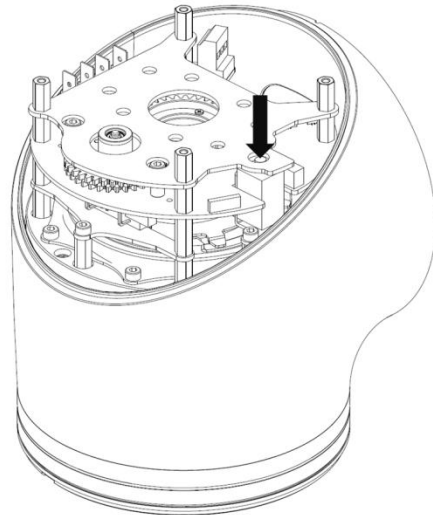


Figure 1: References of Joints by Models



4th / 5th /6th Joint



1st/2nd/3rd Joint

Figure 2: Reference of Brake Solenoid by Joints






WARNING:

1. Due to gravity, additional supports are recommended when manually releasing the brake.
2. When manually moving each robot joint, the movement angle must be within a range of $\pm 45^\circ$.

2.10 Labels

The following labels, especially the warning ones, are attached to the locations where specific dangers may occur. Be sure to comply with description and warnings of the labels when operating to keep the manipulator safely. Do not tear, damage, or remove the labels. Be very careful if you need to handle the parts where the labels are attached.

A		Do not put your hand or fingers close to the moving parts
B		Be careful not to be close to the moving parts and nearby areas to avoid collision
C		Do not touch any internal electric parts to avoid electric shock

3. Transportation and Storage

Transport the TM Robot using its original packing materials. If you will need to transport the TM Robot after unpacking, store the packing materials in a dry place. Hold both arms of the TM Robot during transportation. Support the arms while tightening the base screws.

Lift the control box by its handles. Store the cables before transportation.



WARNING:

Pay attention to your posture when moving the arm and control box cartons to avoid back injury. The Corporation will not be liable for any injuries caused during transportation.



WARNING:

This product must be shipped and stored in a temperature-controlled environment, within the range -20°C to 60°C (-4°F to 140°F). The recommended humidity is up to 75 percent, non-condensing. It should be shipped and stored in the supplied package, which is designed to prevent damage from normal shock and vibration, You should protect the package from excessive shock and vibration.

The product must always be stored and shipped in an upright position in a clean, dry area that is free from condensation. Do not lay the package on its side or any other non-upright position: this could damage the product.

4. System Hardware

4.1 Overview

This chapter introduces the mechanical interface of the TM Robot System.

4.2 System Overview

TM Robot is made up of the robot arm and control box (including a robot stick).



Robot arm



Control Box



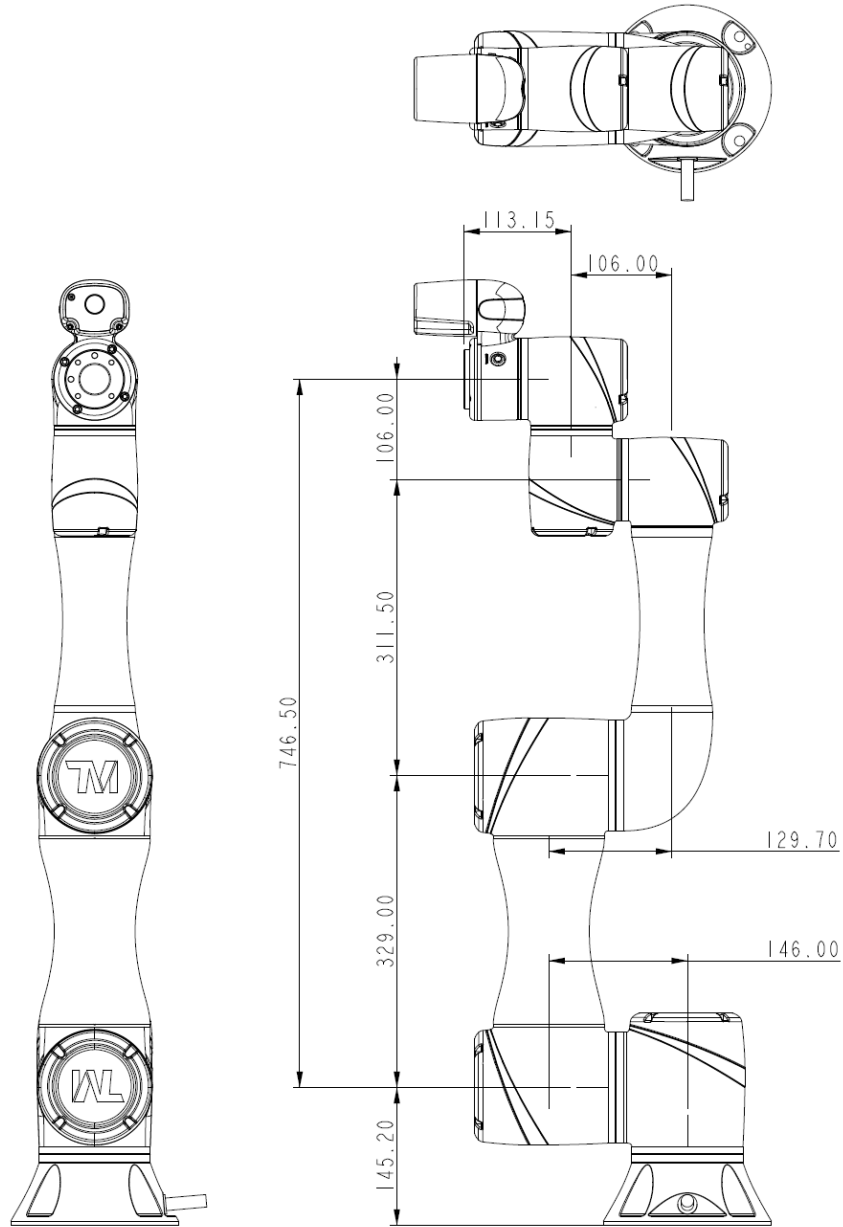
Robot Stick

Figure 4: System Overview

4.2.1 Robot Arm

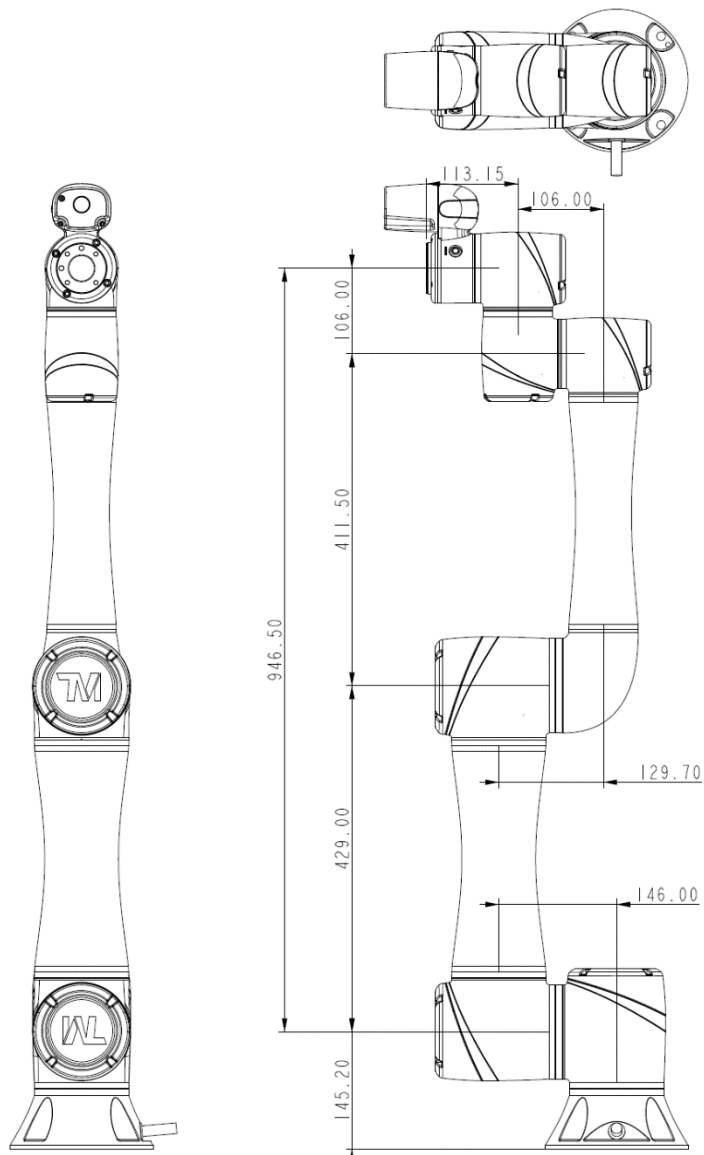
4.2.1.1 Dimension Drawings of Robot

Shown below is the dimension drawing of the robot



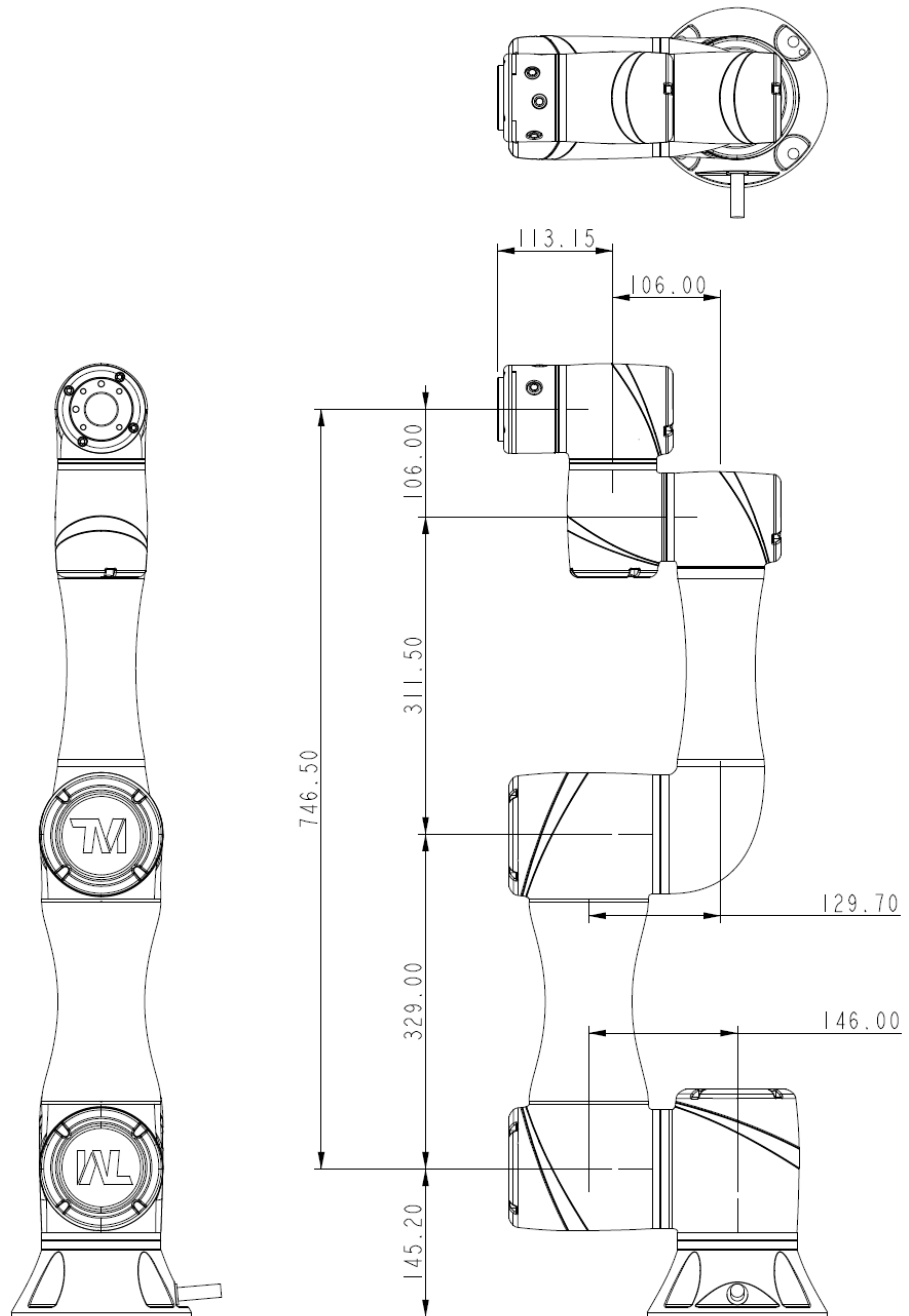
TM5-700 / TM5M-700

Figure 5: Dimension of TM5-700 / TM5M-700



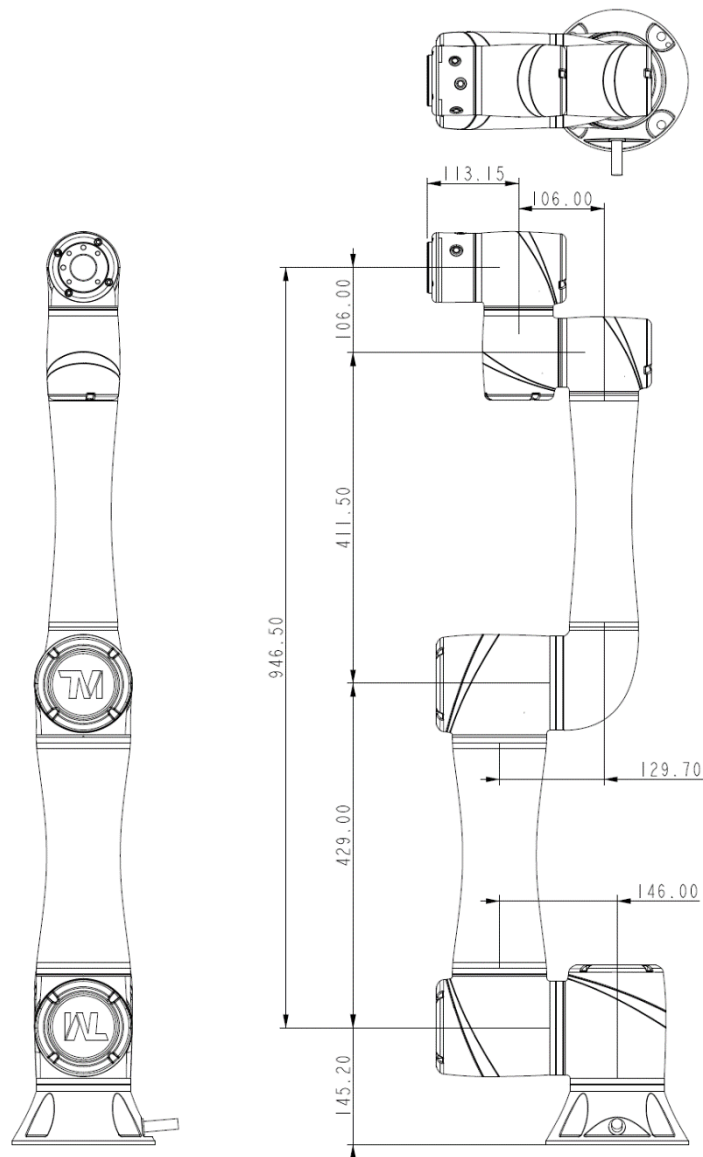
TM5-900 / TM5M-900

Figure 6: Dimension of TM5-900 / TM5M-900



TM5X-700

Figure 7: Dimension of TM5X-700

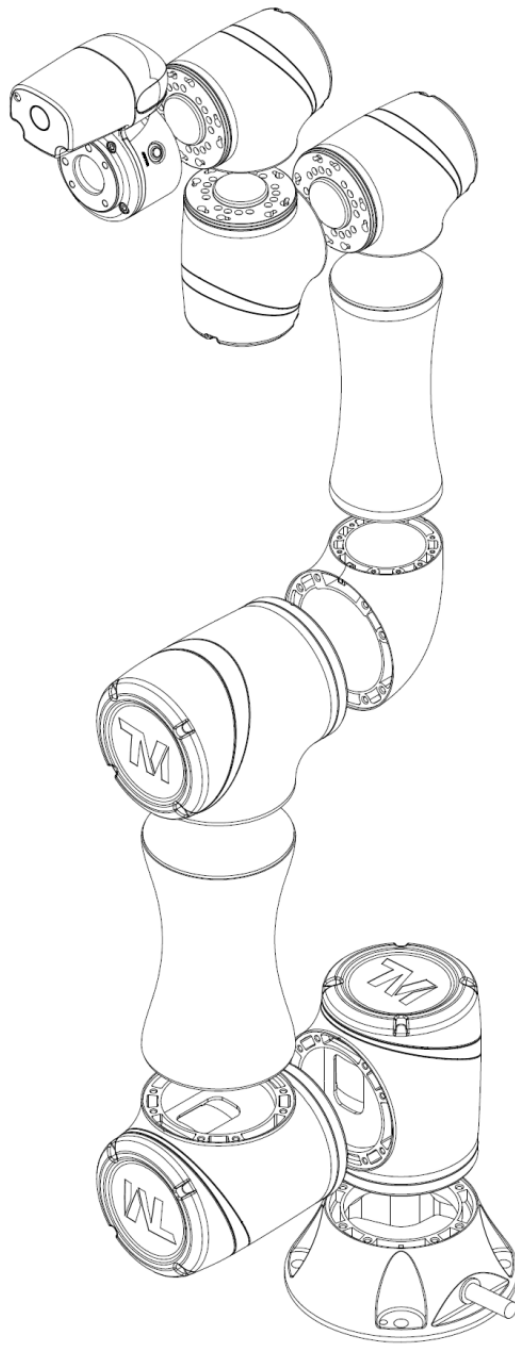


TM5X-900

Figure 8: Dimension of TM5X-900

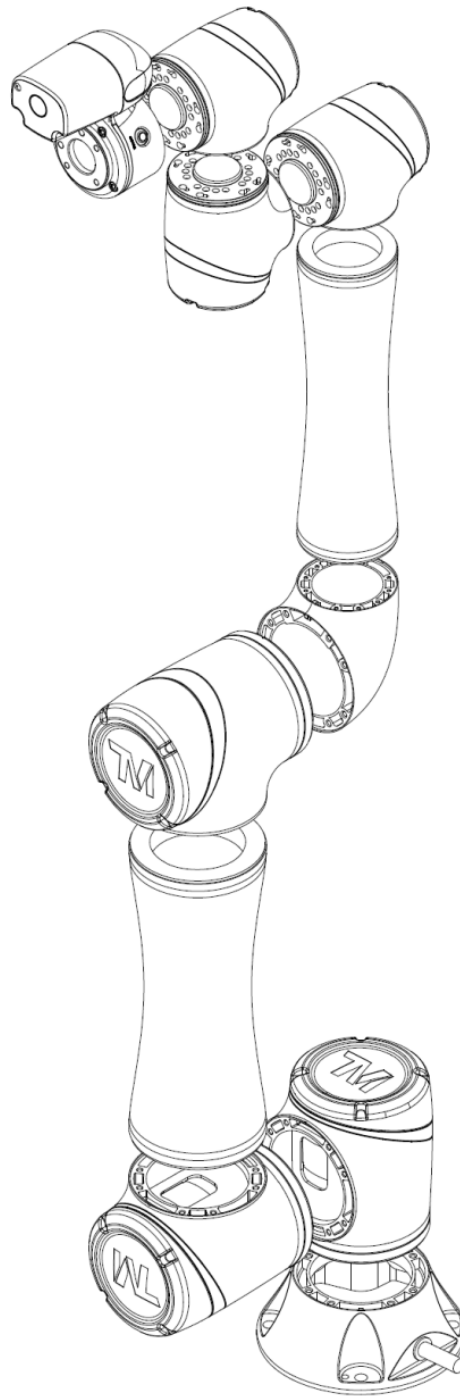
4.2.1.2 Robot Assembly Diagram

Shown below is an illustration of the robot components. To avoid safety risks, do not attempt to disassemble any component on your own. Contact your local corporation support for any service request.



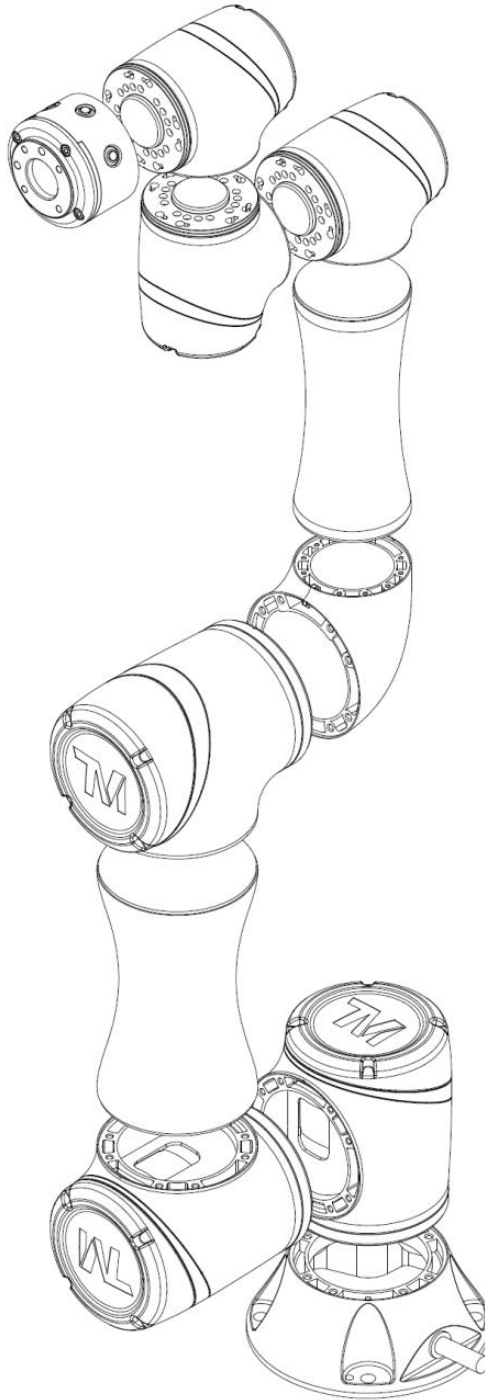
TM5-700 / TM5M-700

Figure 9: Assembly of TM5-700 / TM5M-700



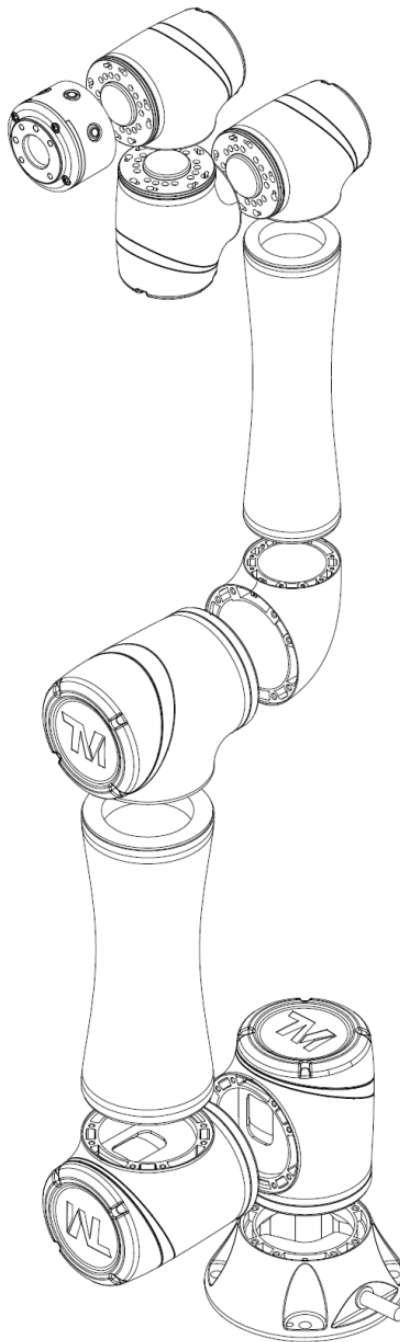
TM5-900 / TM5M-900

Figure 10: Assembly of TM5-900 / TM5M-900



TM5X-700

Figure 11: Assembly of TM5X-700



TM5X-900

Figure 12: Assembly of TM5X-900

4.2.1.3 Range of Motion

The working spherical (radius) range from the base is 700 mm for the TM5-700 series and 900 mm for the TM5-900 series.

DANGER:

With the exception of an individual being in full control of robot motion during hand-guiding, personnel shall be outside the safeguarded space when the robot is in motion while in manual mode (i.e. teaching).



The emergency stop on the robot stick shall be readily accessible during manual mode. At least one emergency switch is installed outside of the motion range of the robot. When no motion limit is set for the robot, the motion range of the robot is equal to the maximum motion range of the robot arm. You can set a motion limit to avoid the situation whereby all operations have to be out of the maximum motion range of the robot arm.

The robot stick should be placed in an area that the robot cannot reach. The user should also make sure that the movement of the robot will not be within any area where personnel will enter to press any buttons on the robot stick.

TM5-700 / TM5M-700 / TM5X-700 Movement Range Diagram

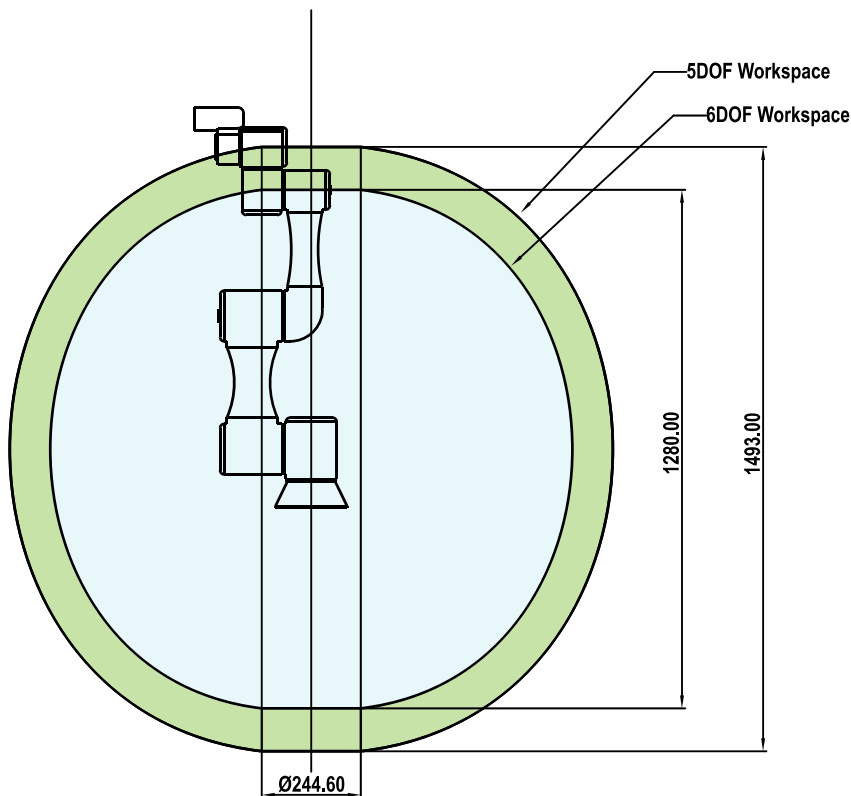


Figure 13: Side View of TM5-700 / TM5M-700 / TM5X-700 Movement Range Diagram

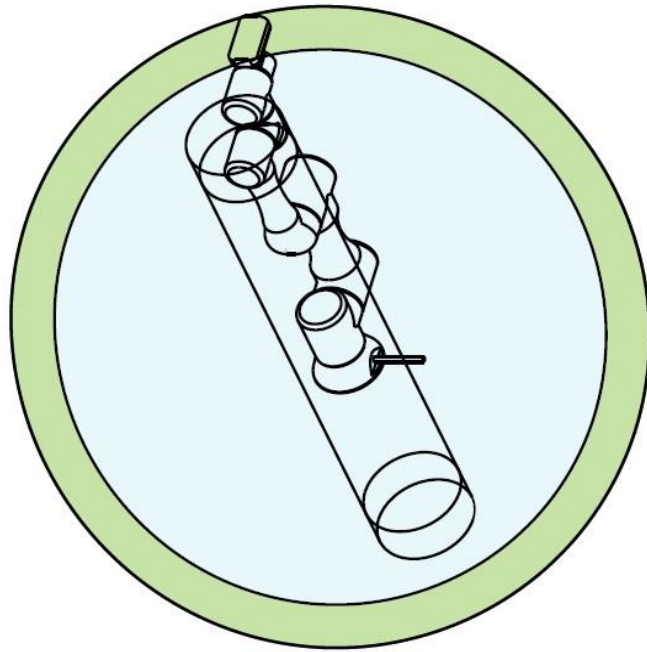
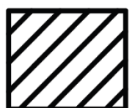
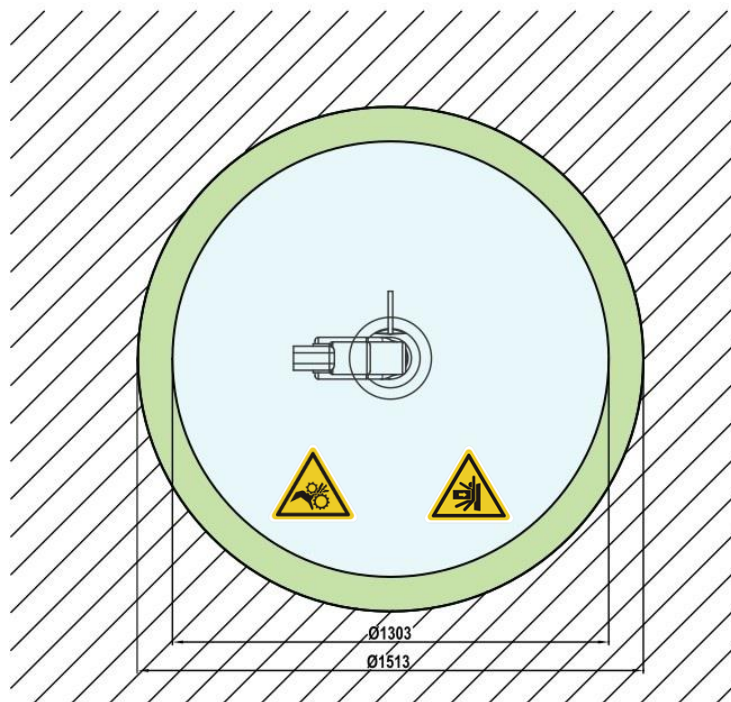


Figure 14: Pictorial view of TM5-700 / TM5M-700 / TM5X-700 Movement Range Diagram



Operator
Position



Warning: Risk of crushing
within the operating area of
the arm.



Warning: Risk of collision within
the operating area of the arm.

Figure 15: Top View of TM5-700 / TM5M-700 / TM5X-700 Movement Range

TM5-900 / TM5M-900 / TM5X-900 Movement Range

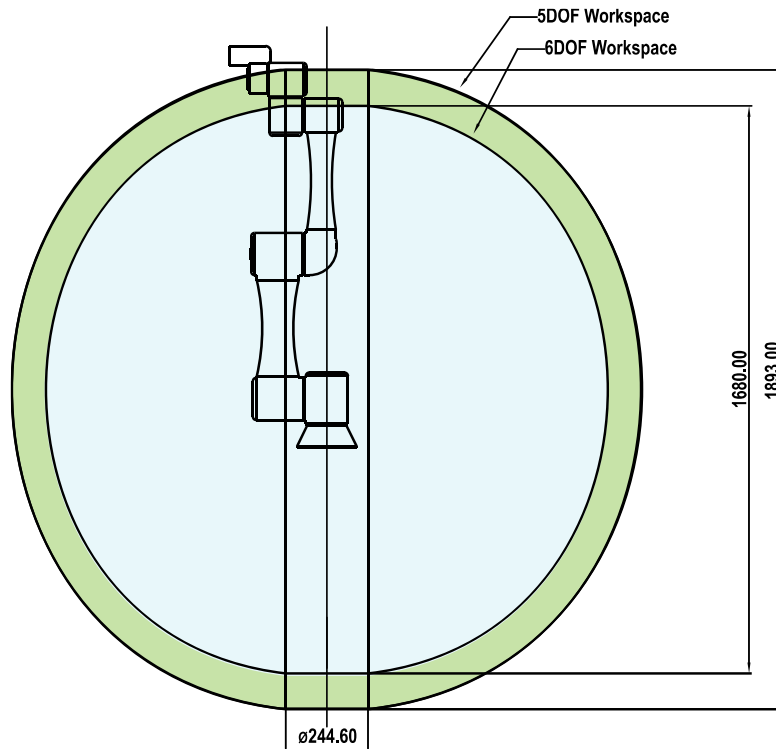


Figure 16: Side View of TM5-700 / TM5M-700 / TM5X-700 Movement Range Diagram

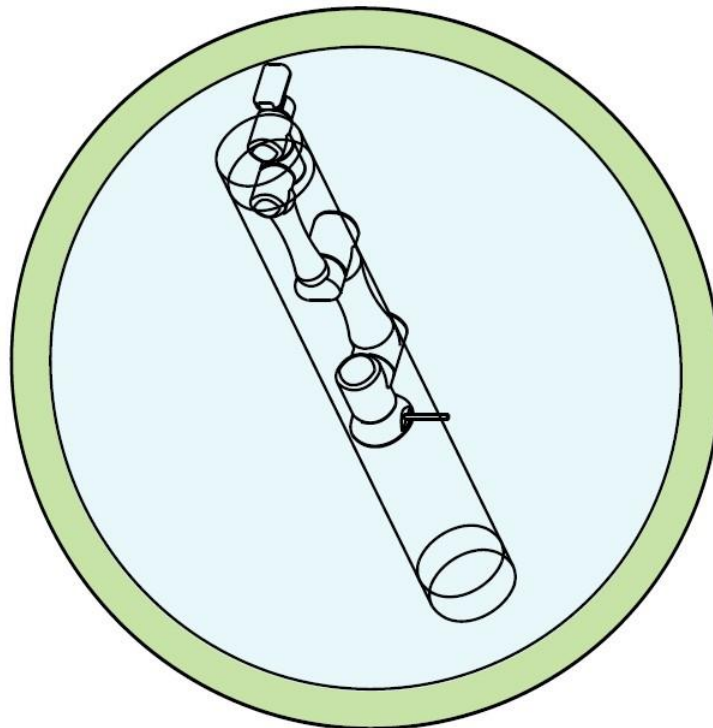
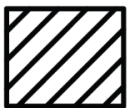
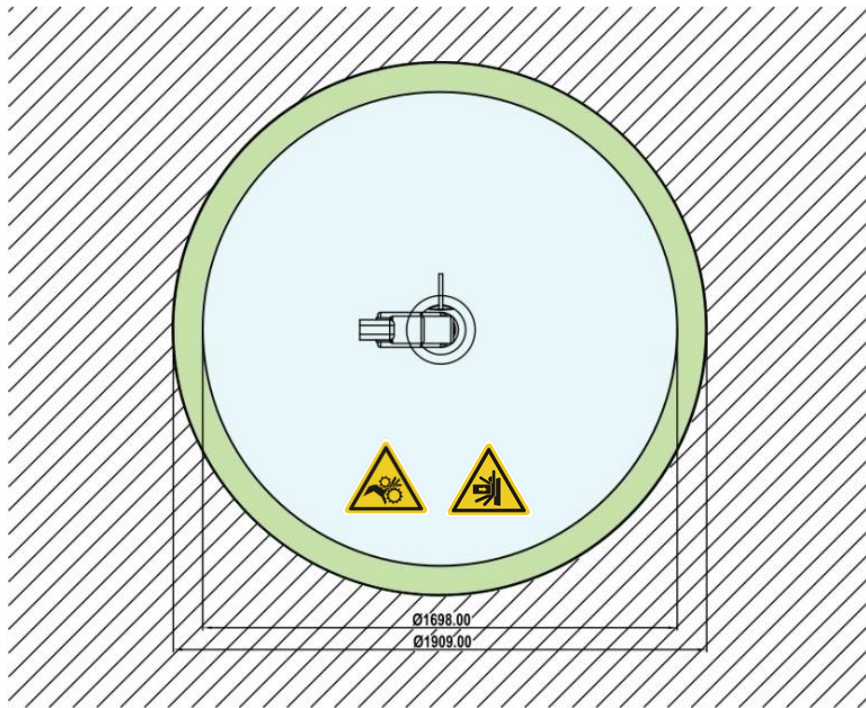


Figure 17: Pictorial Views of TM5-900 / TM5M-900 / TM5X-900 Movement Range



Operator
Position



Warning: Risk of crushing
within
the operating area of the arm.

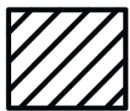
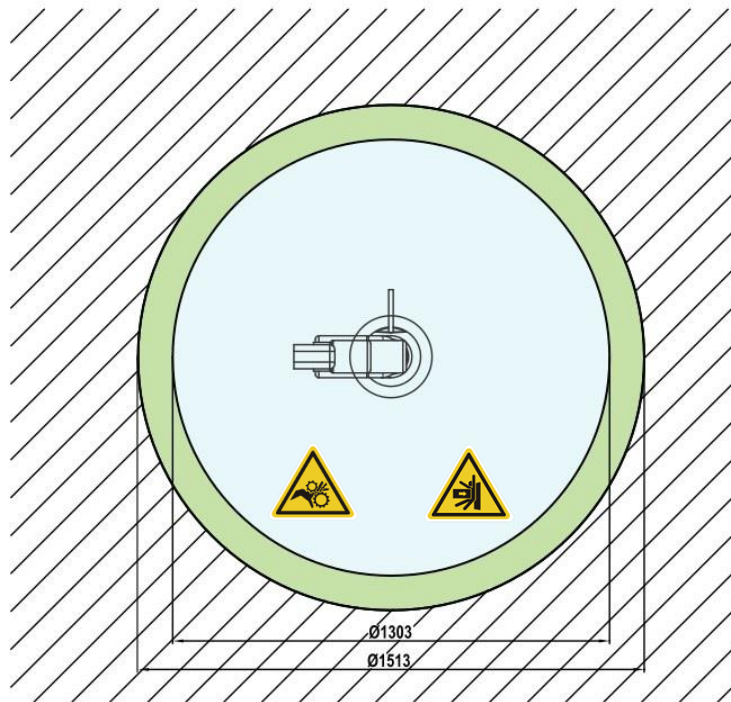


Warning: Risk of collision within
the operating area of the arm.

Figure 18: Top View of TM5-900 / TM5M-900 / TM5X-900 Movement Range

4.2.1.4 Robot Hazard Zone Diagram and Operator Position Diagram

Shown below is an illustration of the robot hazard zone and operator position diagrams. Do not operate the robot while anyone is inside of the hazard zone to avoid safety risks.



Operator
Position

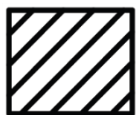
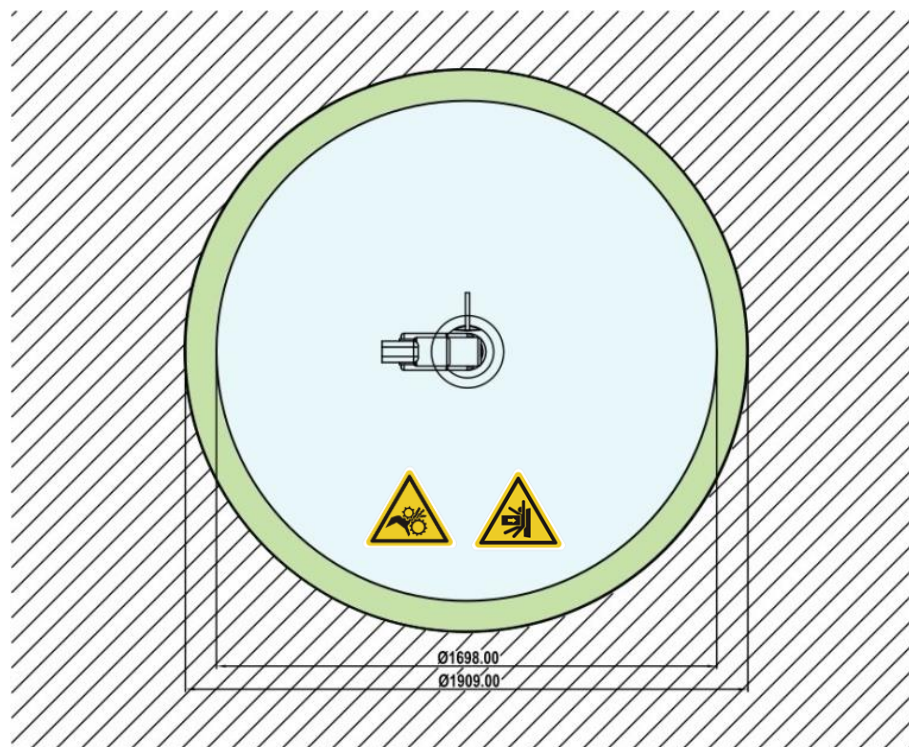


Warning: Risk of crushing
within
the operating area of the arm.



Warning: Risk of collision within
the operating area of the arm.

Figure 19: Robot Hazard Zone Diagram and Operator Position Diagram of TM5-700 / TM5M-700 / TM5X-700



Operator Position



Warning: Risk of crushing within the operating area of the arm.



Warning: Risk of collision within the operating area of the arm.

Figure 20: Robot Hazard Zone Diagram and Operator Position Diagram of TM5-900 / TM5M-900 / TM5X-900

4.2.1.5 Payload and Torque

The maximum allowed payload of the robot arm is related to its center of gravity offset, which is defined as the distance from the center point of tool flange to the payload's center of gravity.

The following figure shows the relationship between payload and the center of gravity offset:

TM5-700 / TM5M-700 / TM5X-700

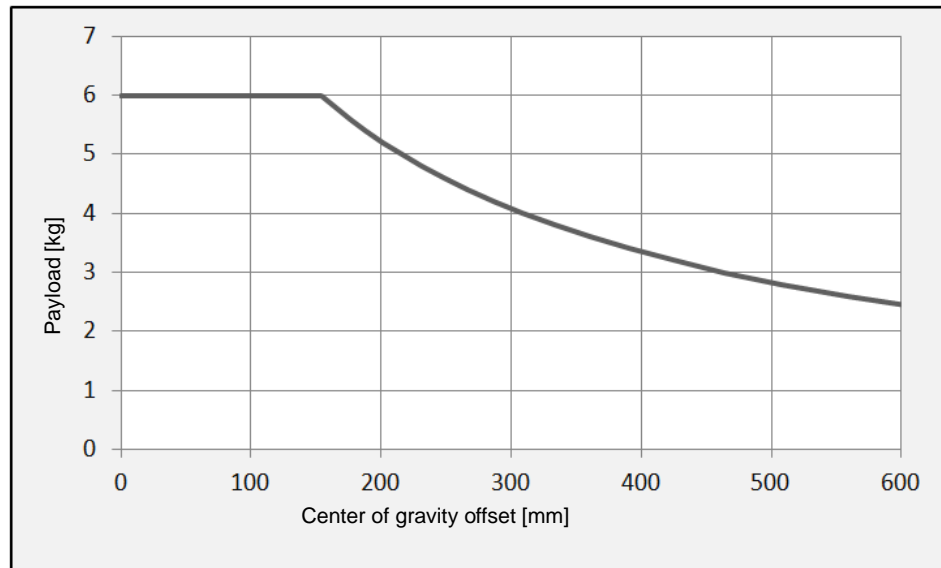


Figure 21: Relationship between Payload and the Center of Gravity Offset in TM5-700 / TM5M-700 / TM5X-700

TM5-900 / TM5M-900 / TM5X-900

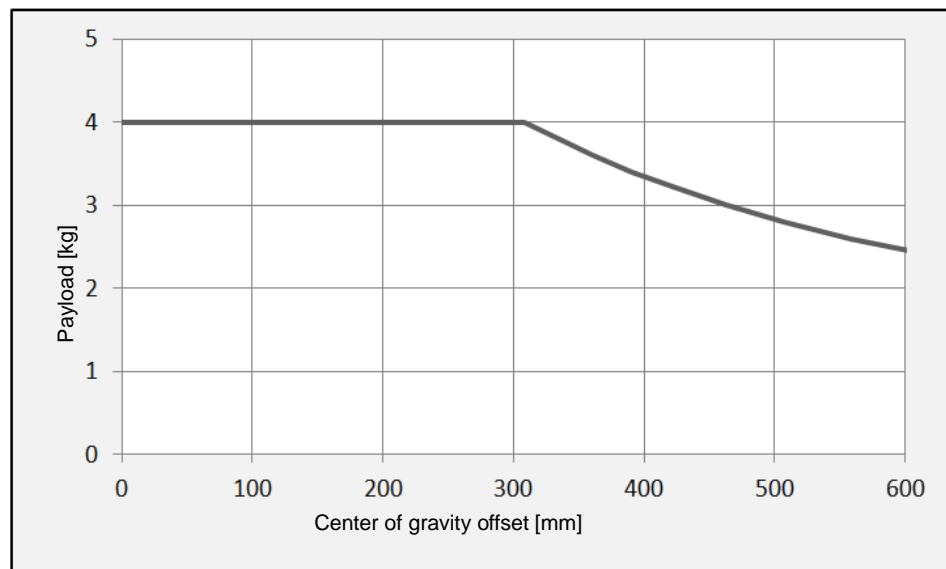


Figure 22: Relationship between Payload and the Center of Gravity Offset in TM5-900 / TM5M-900 / TM5X-900

Refer the table below for the rated torque and the limit of repeated peak torque of the robot. Exceeding torque may reduce the life of the robot or damage the robot.

Model	TM5-700 & TM5-900 Series	
Item	Rated torque	Limit for repeated peak torque
J1	118	157
J2	118	157
J3	118	157
J4	23	43
J5	23	43
J6	23	43
Unit: Nm		

Table 4: Rated Torque and Limit for Repeated Peak Torque of Regular Payload Robot Series



WARNING:

Use the total weight of the end-effector and the payload to stay within the payload rating of the robot. Ensure that the system never exceeds that maximum payload.

You should perform a full risk assessment that includes the end-effector and payload samples, to ensure the safety of the entire system.

4.2.1.6 Robot Arm Installation

The robot can be secured to another surface with the use of (4) M10 screws and washers. The mounting pattern is shown below. The recommended tightening torque is 40 Nm.

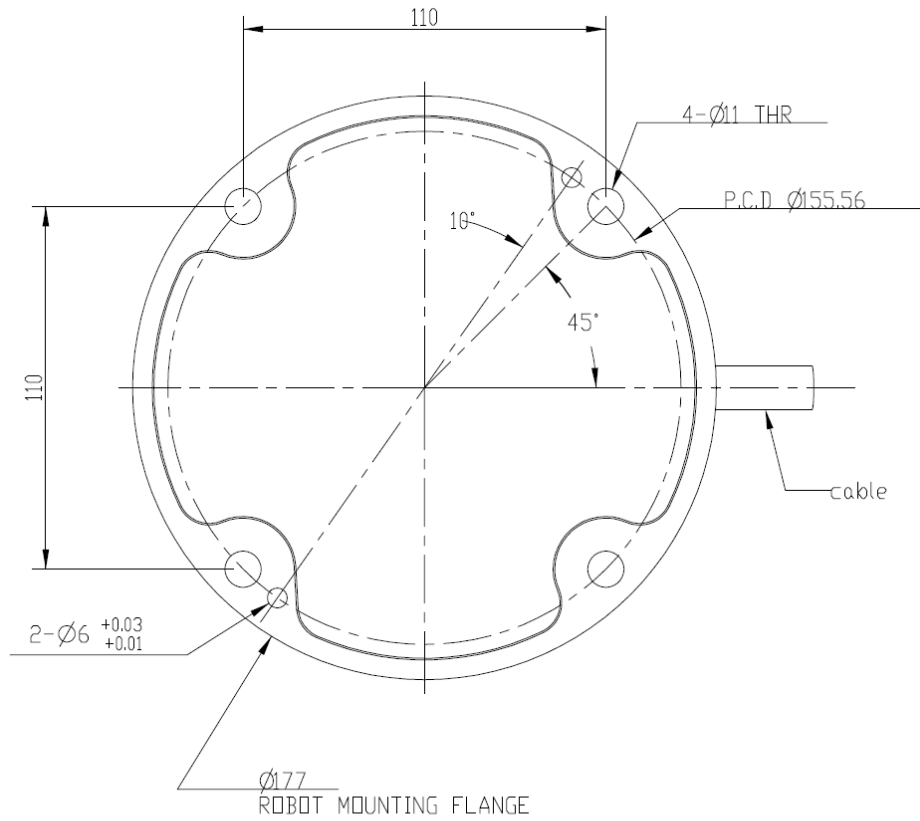
Optional - Two openings for 6 mm position pins are provided for more secure position mounting.

Ensure the strength of the mounting surface and its surround area before installations for upside down mounting and side mounting such as on the ceiling or the wall. Wherever the installation takes place, the robot setting remains equivalent.



DANGER:

1. The TM Robot must be securely and tightly screwed down before use. The strength of the mounting surface must be sufficient.
When operating at high speed, the robot can generate up to 350 N reaction force to the mounting surface and screws. In order to avoid decreased performance caused by robot slip or vibration, the recommended mounting surface should be a steel plate at least 20 mm thick, its flatness should be 0.1 mm or less, its surface roughness should be Rz25 or less. The recommended screw should be M10 x L30 mm, at least 8.8 strength.
2. Do not immerse TM Robot in water. Installation in water or a humid environment will permanently damage the robot.



BOTTOM VIEW OF ROBOT BASE

Figure 23: Bottom View of Robot Base

4.2.2 Robot End Module

4.2.2.1 End Module Components

TM5-700/ TM5M-700/ TM5-900 / TM5M-900 End Module Components

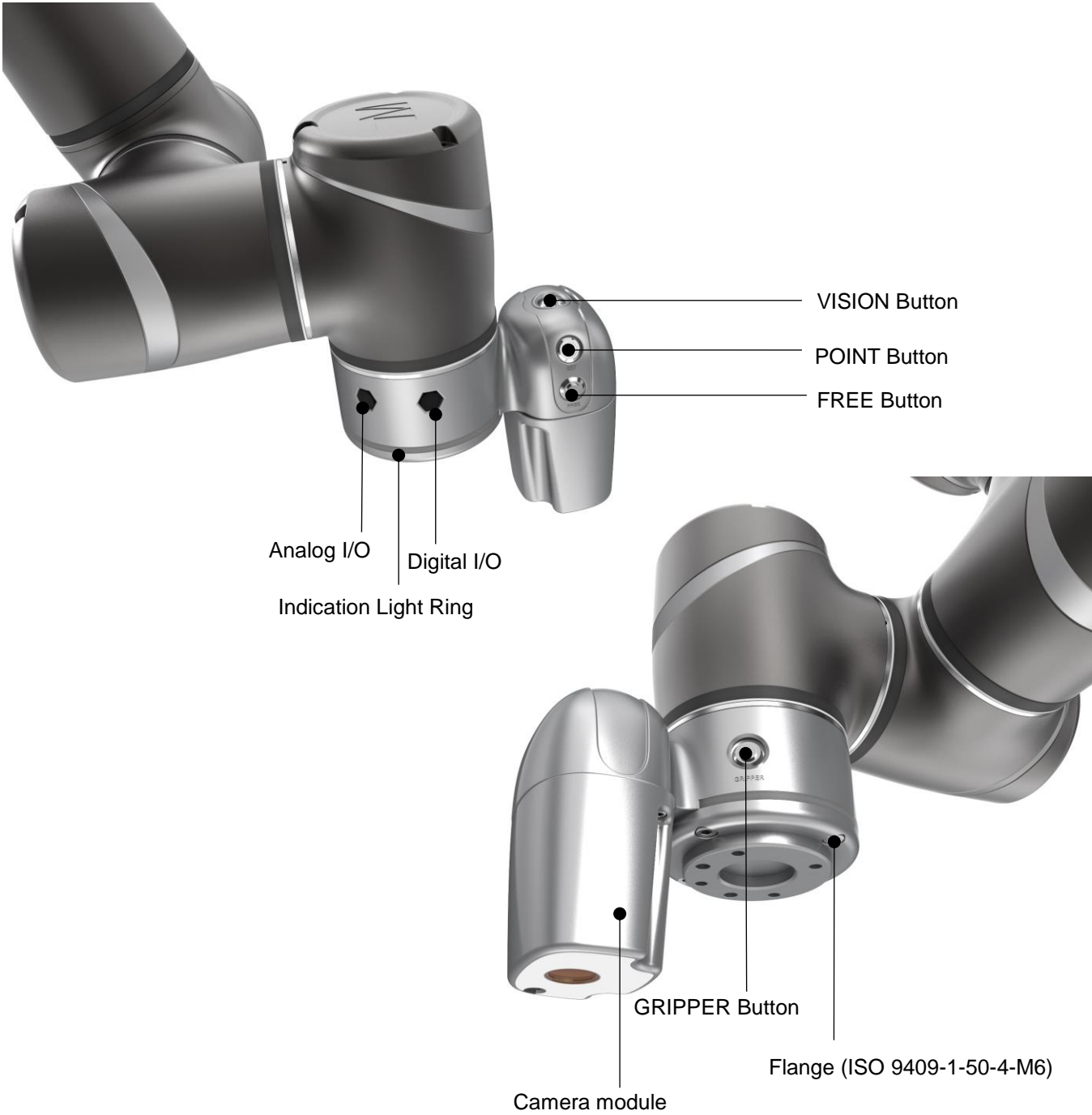


Figure 24: References of TM5-700/ TM5M-700/ TM5-900 / TM5M-900 End Module Components

TM5X-700 / TM5X-900 End Module Components

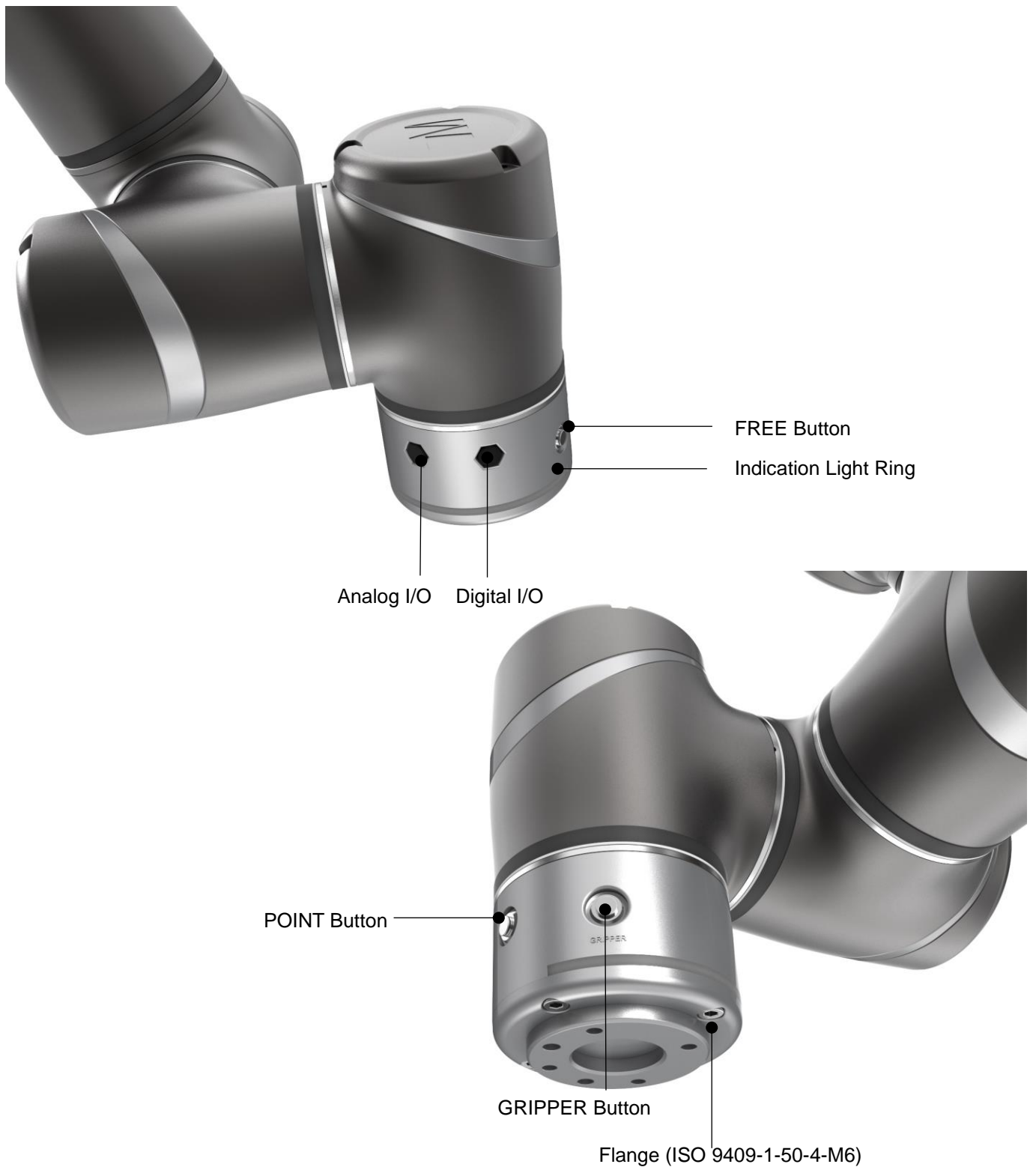


Figure 25: References of TM5X-700 / TM5X-900 End Module Components

4.2.2.2 End Flange Surface

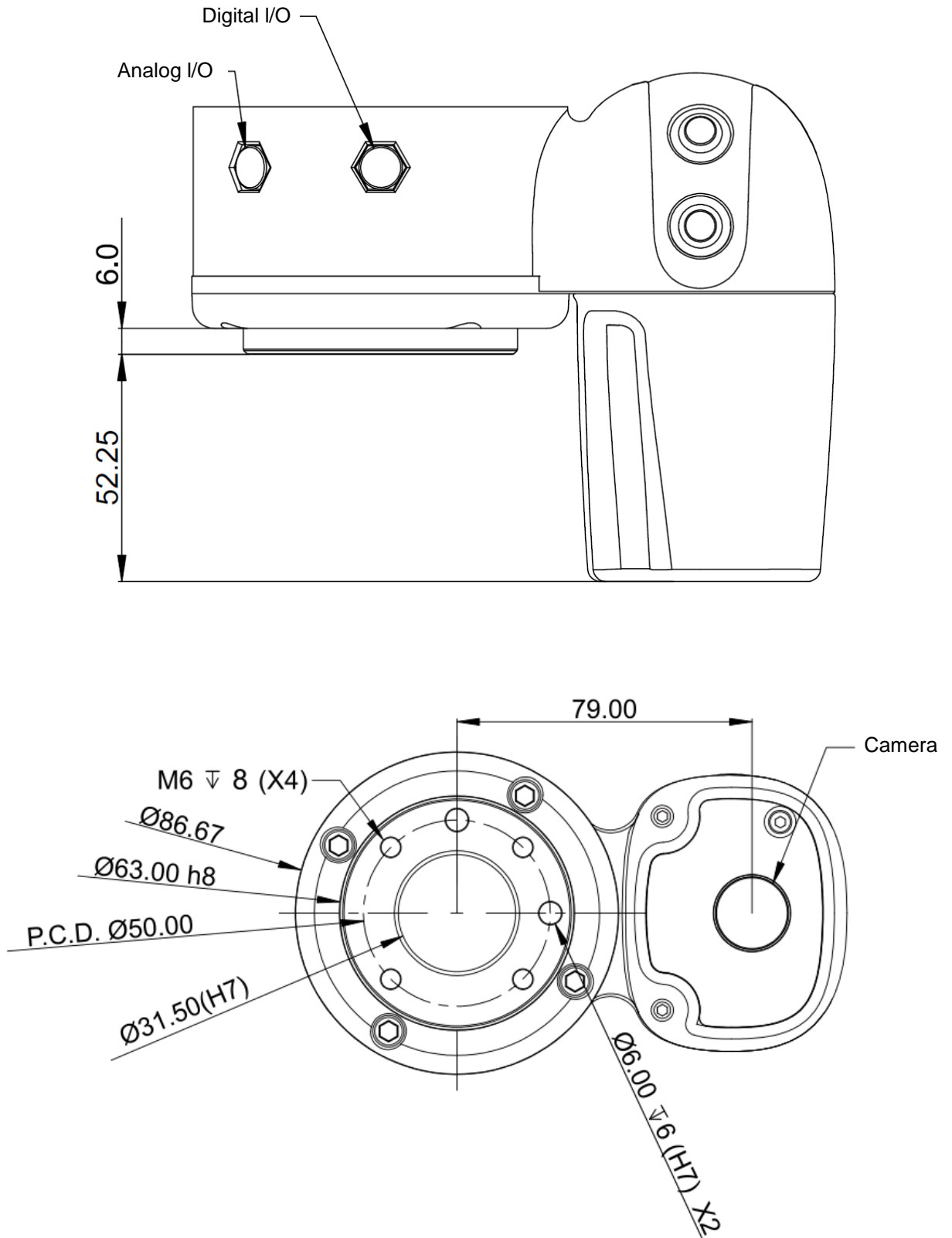


Figure 26: References of End Flange Surface

4.2.2.3 End Mounting Caution

The TM5 Series uses four M6 threaded holes on the end flange and four M6 screws for mounting tools. A tightening torque of 9 Nm is recommended. If your application requires higher precision, you can use two positioning pins with a diameter of 6 mm for a more secure mounting.



DANGER:

Tools must be properly tightened when using this product. Improper tightening may cause the tool or part to fall out, or even cause personal injury and death.

4.2.2.4 End Indication Light Ring Table

The Indication Light Ring of the TM Robot has several colors which represent different modes and error status. Refer to the Software Manual for the definition of the light colors.

4.2.3 Control Box

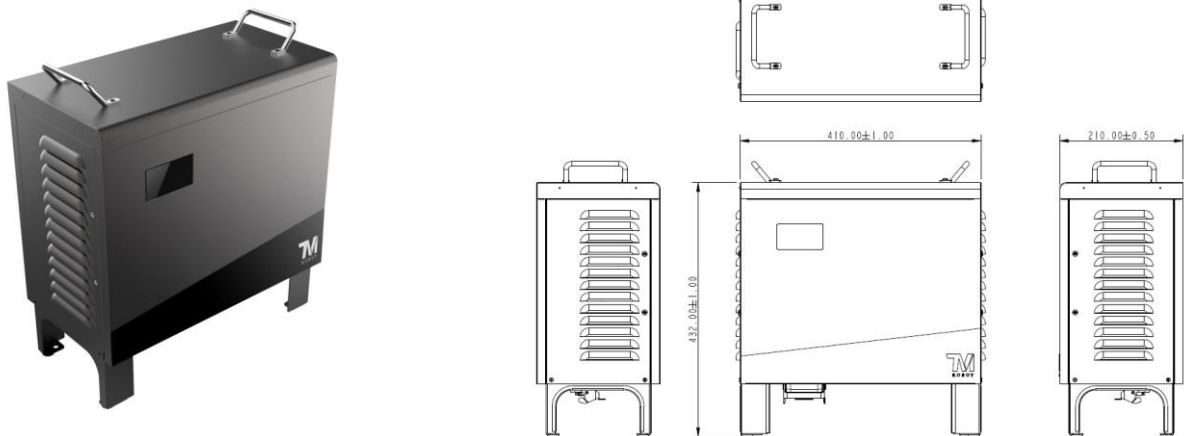


Figure 27: The Exterior and Diagram of the Control Box



CAUTION:

The control box can be placed on the floor or in your working cell. Note that 5 cm clearance should be left at both sides for air flow.

4.2.3.1 Robot Stick

The Robot Stick has 6 function buttons, 3 indicator lights, 1 Emergency Switch, and 1 QR-code. Their functions are as follow:

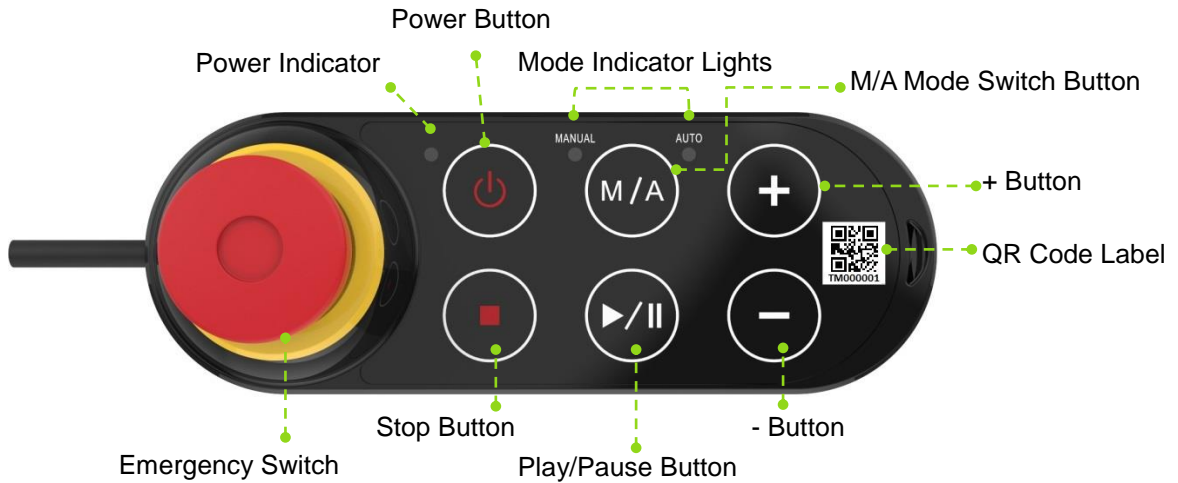


Figure 28: Robot Stick



CAUTION:

When operating the robot stick, do not use other objects than fingers to press the robot stick.

Items	Basic Function
Emergency Switch	Default emergency button for the robot
Power Button	Power initiation (single press)/ Shutdown (long press)
M/A Mode Switch Button	Toggle Manual/Auto Mode (single press). See Safety Manual for details.
Play/Pause Button	Play/Pause Project (single press)
Stop Button	Press this button to stop any project.
+/- Button	Adjust project speed (single press) under Manual Trial Run Mode. See Safety Manual for details.
Power Indicator	This indicator shows the robot's power status. Not on: Switched off Flashing: Booting Constant: Startup completed
Mode Indicator Lights	One is Manual Mode, the other one is Auto Mode. They show the robot's current operating mode. Once boot up is complete only one will always be on.
QR Code Label	The content of the SSID is also the robot's name in TCP/IP network.

Table 5: Robot Stick Basic Functions

Items	Advanced Function
Emergency Switch	- Press and release, and then wait for 3 seconds to enter Safe Start up Mode. - Press and release to enter Safe Start up Mode while booting.
Play/Pause Button	Play/pause visual calibration operation (single press)
Stop Button	Stop visual calibration operation (single press)
+ - Button	- Hold to jog the robot at the HMI robot controller page (Hold to Run). See Safety Manual for details. - Lock/ Unlock: hold down both add and subtract until the mode indicator flashes, then follow the sequence "-", "+, -, -, +" to lock/unlock the Robot Stick (except the Power Button)

Table 6: Robot Stick Advanced Functions



CAUTION:

The robot stick is magnetic so that it can be attached to iron or steel surfaces. However, the risk of falling or rotating caused by poor attachment should be taken into account. It is recommended using the Robot Stick Stand (official accessory) to secure the robot stick. The Robot Stick Stand should be fixed with screws. Always attach the robot stick when it is not in use. The robot stick should be placed in a way such that the signal cables are routed to avoid damage caused by pulling.



DANGER:

1. The control box, cables, power signal cables, and robot stick cannot be used when any of them is in contact with liquids. This may result in personal injury or death.
2. The control box has an IP32 rating but should still is not recommended to be used in dusty and humid environments. Particular attention should be paid to environments with conductive dust (such as metal particles).
3. Be noted that the control box can only be at standing pose to have IP32 rating.

4.2.3.2 SEMI Emergency OFF Box

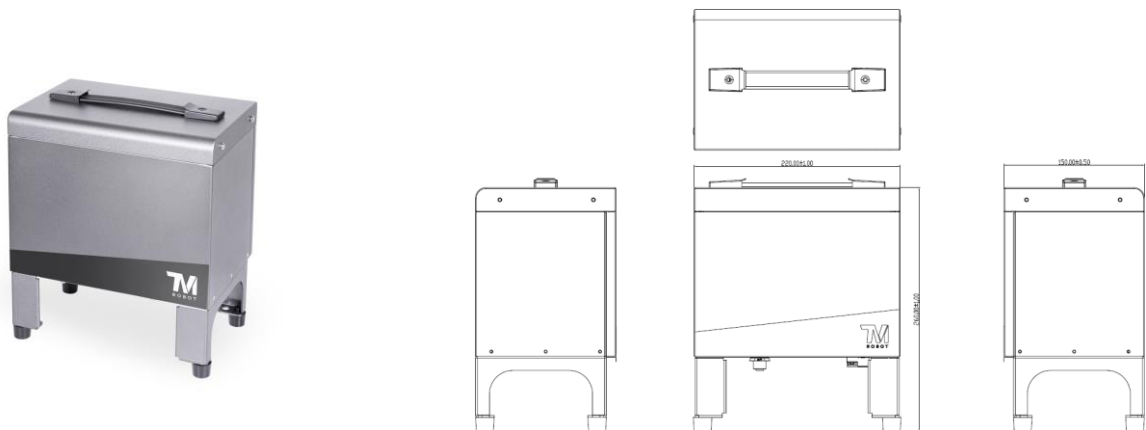


Figure 29: The Exterior and Diagram of the SEMI Emergency OFF Box

4.3 Operating Position of TM Robot with AGV/AIV

When TM Robot is placed on an AGV/AIV in operation, the TM Robot should be paused and should not exceed the footprint of the AGV/AIV.

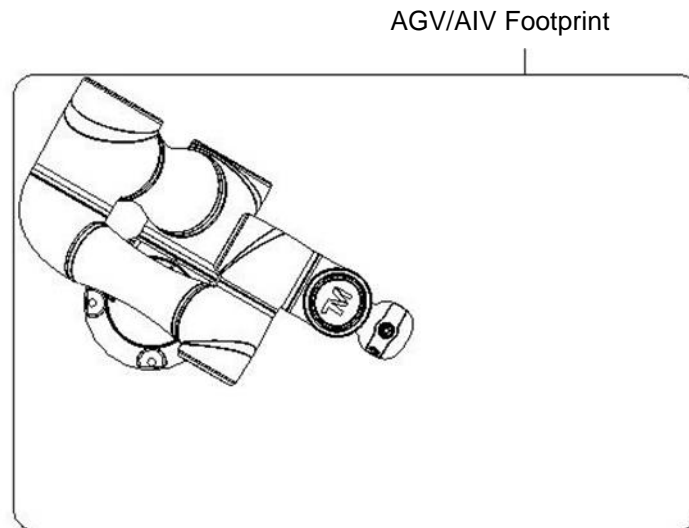


Figure 30: Top View of TM Robot Placed on the AGV/AIV

4.4 Working distance and field of view of TM Robot's EIH camera

The field of view of TM Robot's EIH camera varies linearly in accordance with the working distance. The minimum working distance is about 100 mm and the maximum working distance is about 300 mm. The zero working distance point is approximately 49 mm in front of the flange surface and right behind the center of the protection lens.

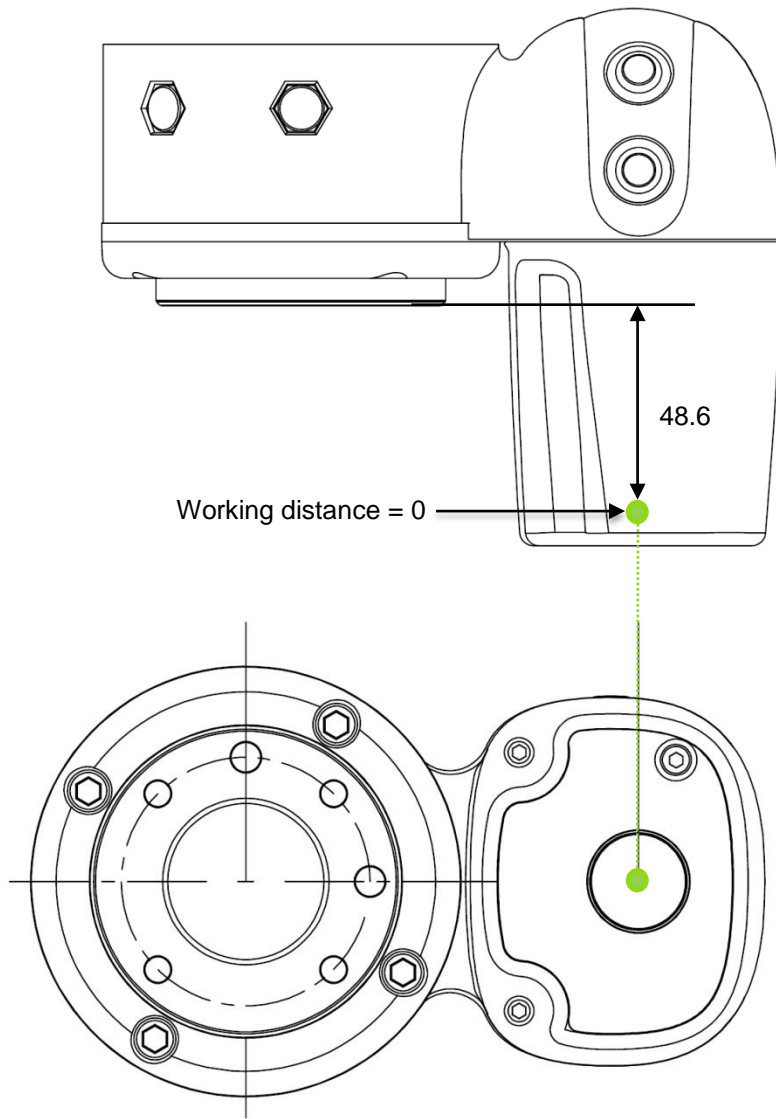


Figure 31: Working Distance and Field of View of TM Robot's EIH camera

The relation between the working distance and the field of view is listed below.

Working distance (mm)	300	100
Field of view (mm)		
Width	281.6	96.9
Height	211.2	72.7

Table 7: The Relation between the Working Distance and the Field of View

5. Electrical Interface

5.1 Overview

This chapter introduces all electrical interfaces of the robot arm and control box.

5.2 Electrical Warnings and Cautions

The application design and installation of the robot should comply with the following warnings.



DANGER:

1. Ensure all pieces of the equipment are kept dry. If water enters the equipment, disconnect the power and contact your supplier.
2. Only use the original cables included with the robot. If you need longer cables, contact your supplier.
3. Ensure that the robot is properly grounded. If the grounding is not correct, it may cause a fire or electric shock.



WARNING:

The I/O cables used for the link between the control box and other pieces of equipment should not be longer than 30 meters, unless testing shows that longer cables are feasible.

5.3 Control Box



WARNING:

Except for USB ports, other interfaces have to be installed while arm is powered off. Do not install while arm is on to avoid abnormal shutdown.

Control Box I/O configuration



REMOTE ON/OFF

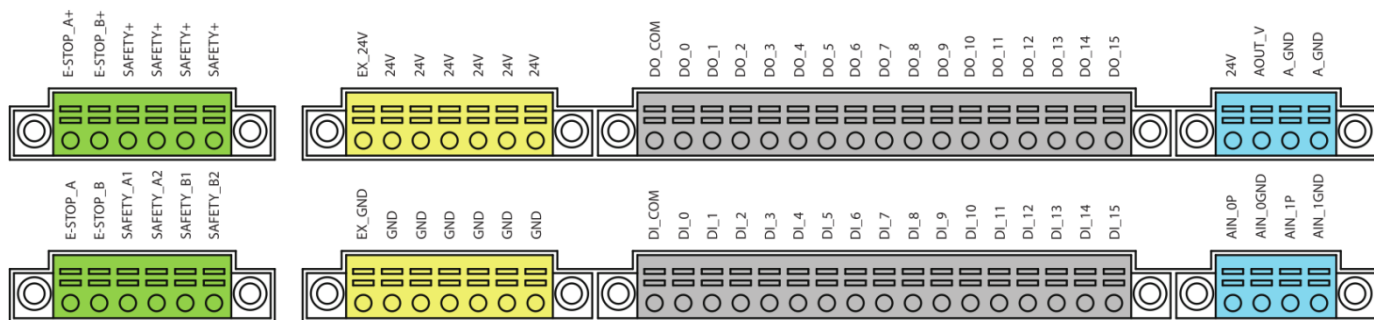


Figure 32: Control Box I/O Configuration (1/2)

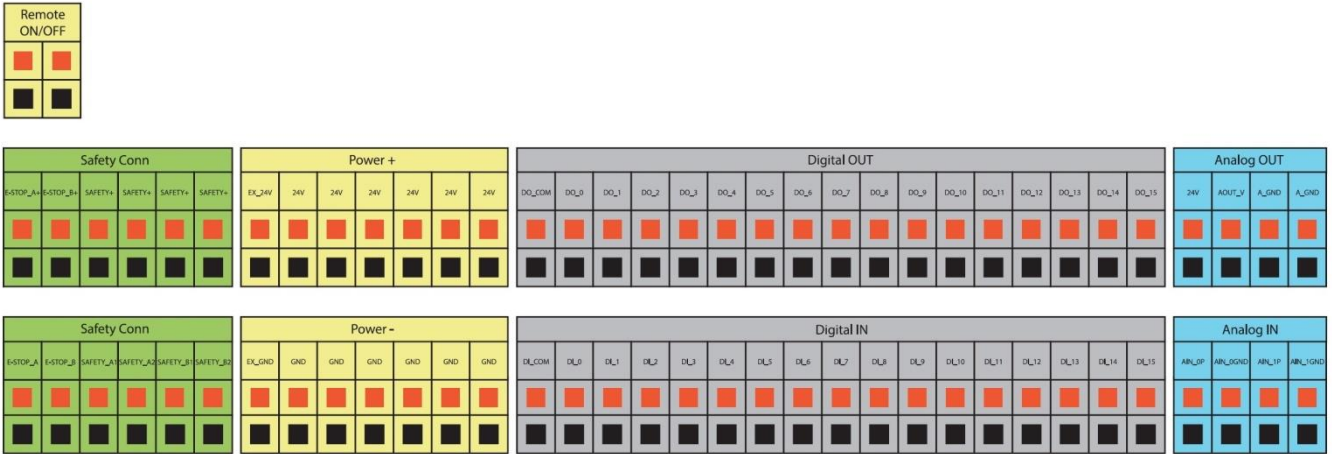


Figure 33: Control Box I/O Configuration (2/2)

5.3.1 Safety Connector

Provides extension ports for Emergency Stop (ESTOP) & Safeguard Port.

1. ESTOP is a N.C. contact (Normally closed). When any connected ESTOP switch is OPEN, the robot enters the Emergency STOP state.
2. Safeguard A Port is a N.C. contact (Normally closed). When Safety A switch is OPEN, the robot enters the Safeguard Pause state.
3. Safeguard B Port is a N.C. contact (Normally closed). When Safety B switch is OPEN, the robot enters the Safeguard Collaborative Mode state.

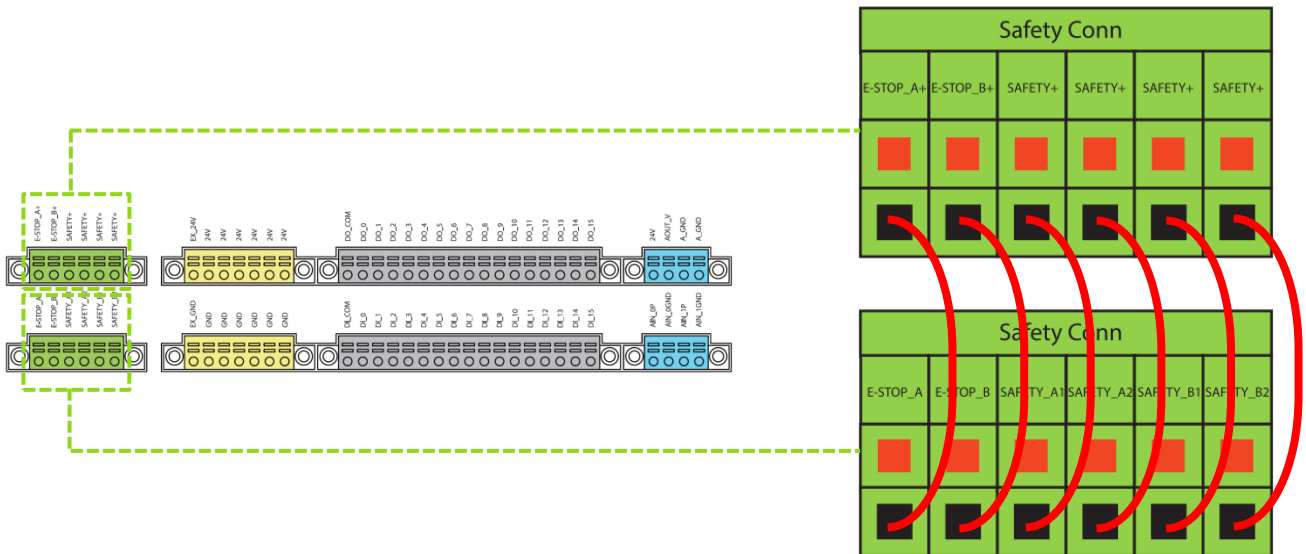


Figure 34: Safety Connector

Application settings of the arm safety device

If the safety device is used to work with the safety connectors on the TM Robot, the safety relay can be connected to the safety connector to work as the normally closed switch triggered by the safety device. If a direct connection between safety device and safety connector on TM Robot is preferred, use a safety device with PNP outputs. The PNP outputs can be connected to either “SAFETY_A1 and SAFETY_A2” or “SAFETY_B1 and SAFETY_B2” to trigger the collaborative mode or pause the robot motion. The PNP outputs can also be connected to “ESTOP_A and ESTOP_B” to trigger the emergency stop. The example circuit wiring diagram can be found below.

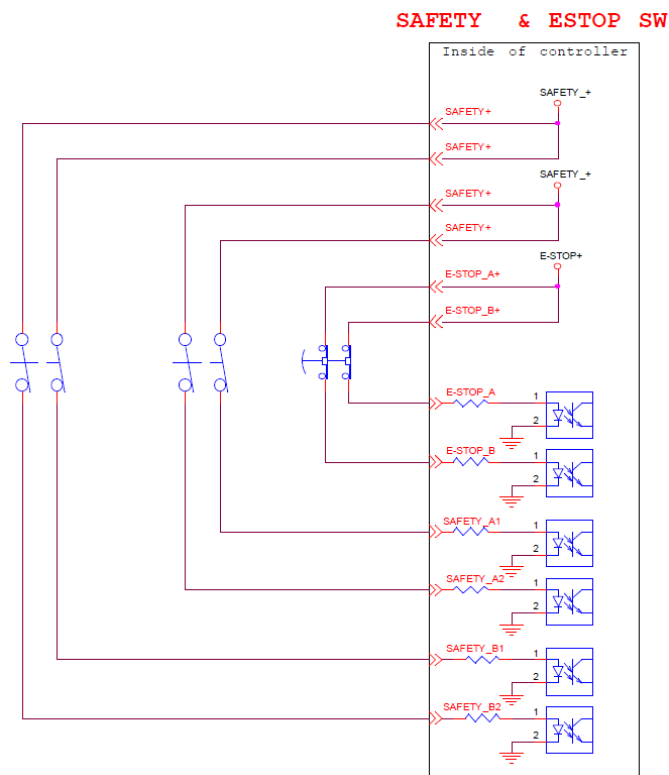


Figure 35: The Wiring Diagram Example of Switch Type Safety Device.

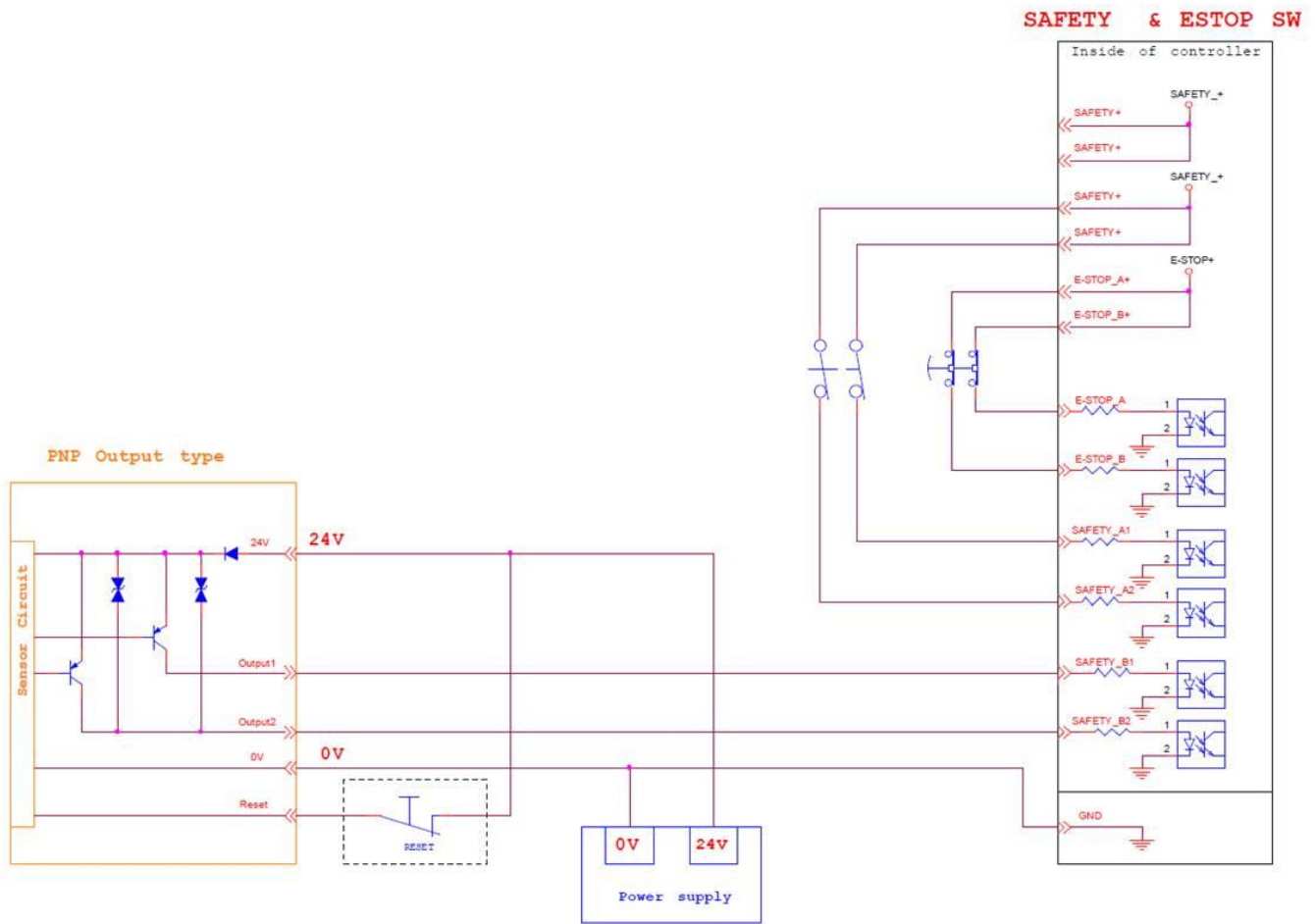


Figure 36: The Wiring Diagram Example of PNP Output Type Safety Device

5.3.2 Power Connector

1. During boot, the control box will check for an external 24V input. If none is found, then it will switch to the internal 24V supply.
2. The control box itself offers a 24V1.5A output (24_EX). If the 24V load exceeds 1.5A, it enters Safe Mode and disables the 24V output.
3. EX24V provides an external 24V input port. If the load exceeds 1.5A an external power supply can be used instead. The load on EX24V must not exceed 3.5A.

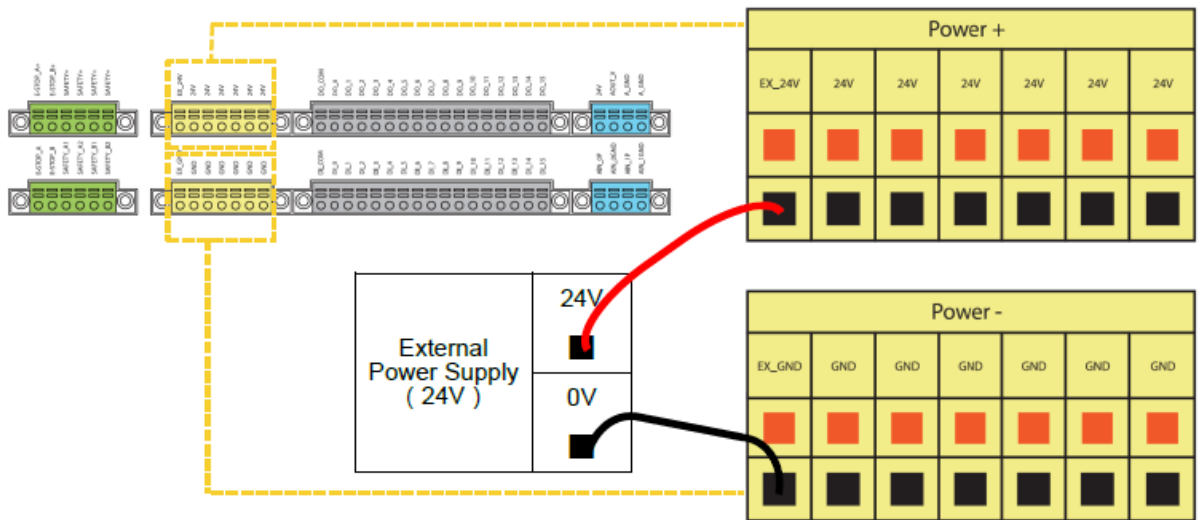


Figure 37: Power Connector

5.3.3 Digital In/Out

Digital input/output each has 16 channels, and its application is connected to the following sections.

5.3.3.1 Digital Input

Inputs can be set to either sink input or source input by selection.

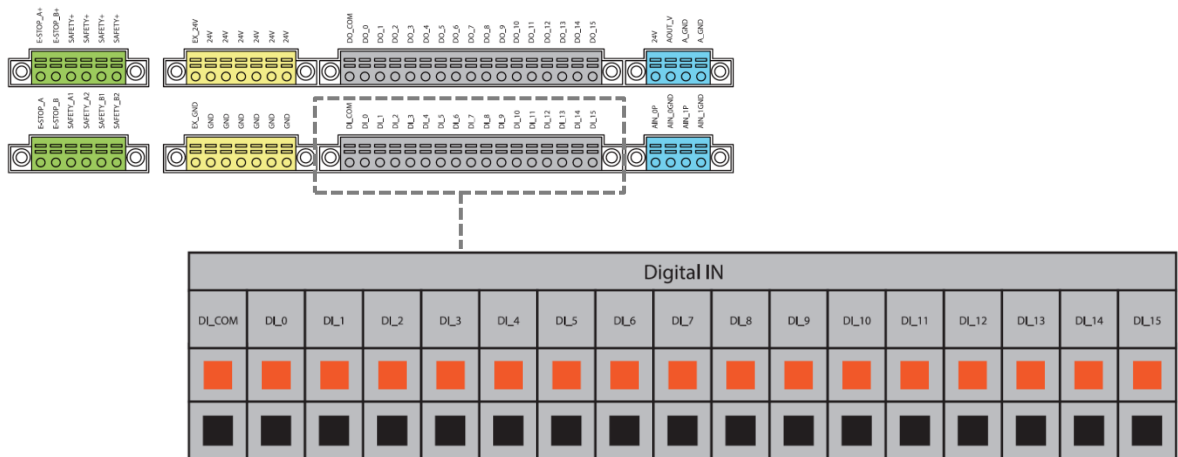


Figure 38: Digital Input

- Set to sink input type

When a device such as a transistor output sensor is connected, NPN open collector transistor output can be used.

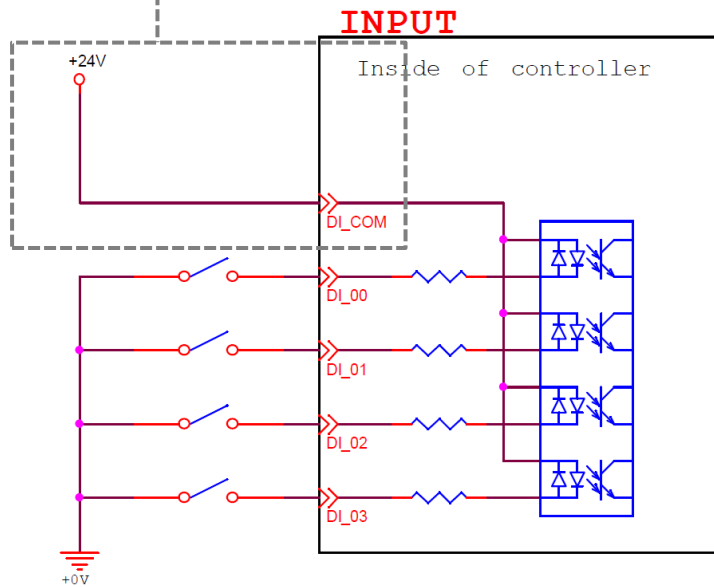
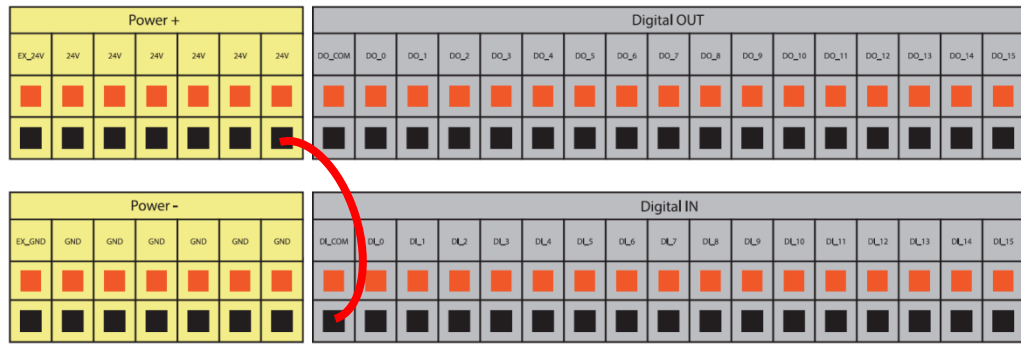


Figure 39: Set to Sink Input Type

- Set to Source input type

When a device such as a transistor output sensor is connected, PNP open collector transistor output can be used.

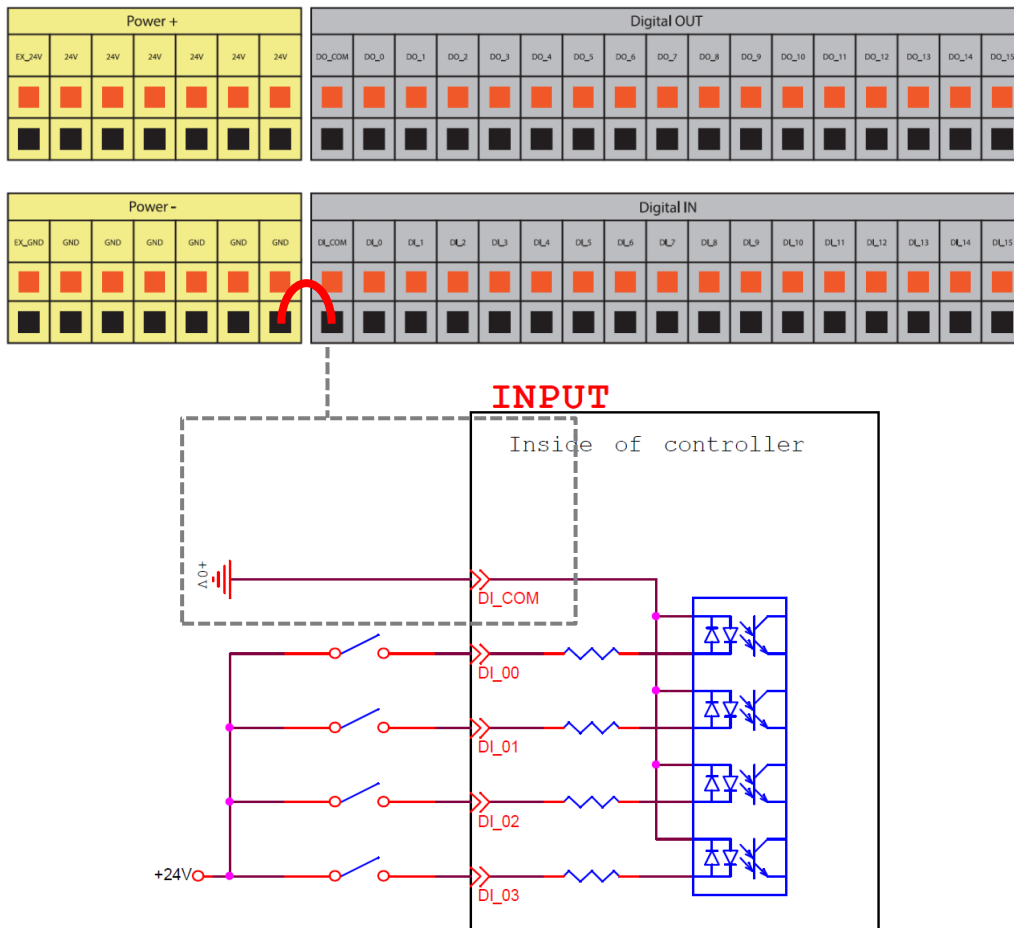


Figure 40: Set to Source Input Type

5.3.3.2 Digital Output

Outputs can be set to either sink output or source output by selection.

The maximum drive current is 300mA per channel. If the load exceeds 300mA, a relay should be used to drive it.

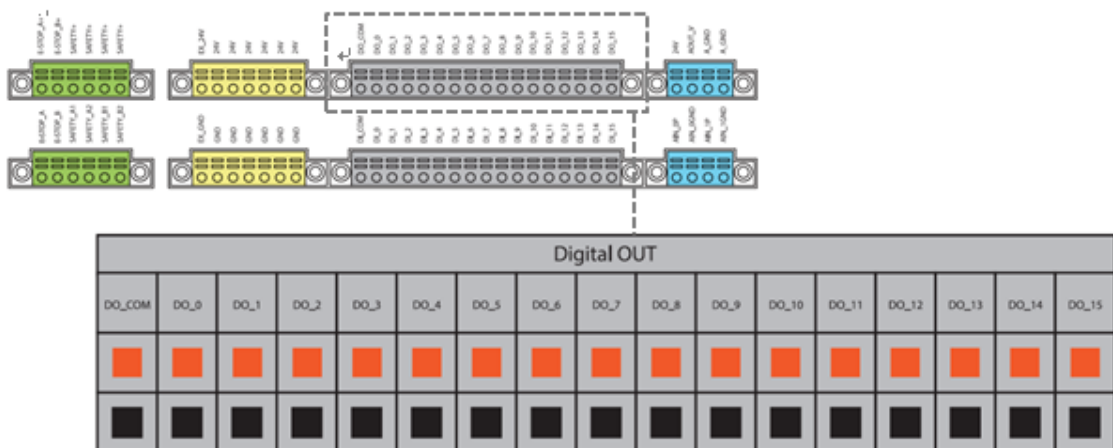


Figure 41: Digital Output

- Set to sink output type

Connect DO_COM terminal to the minus side of the power supply.

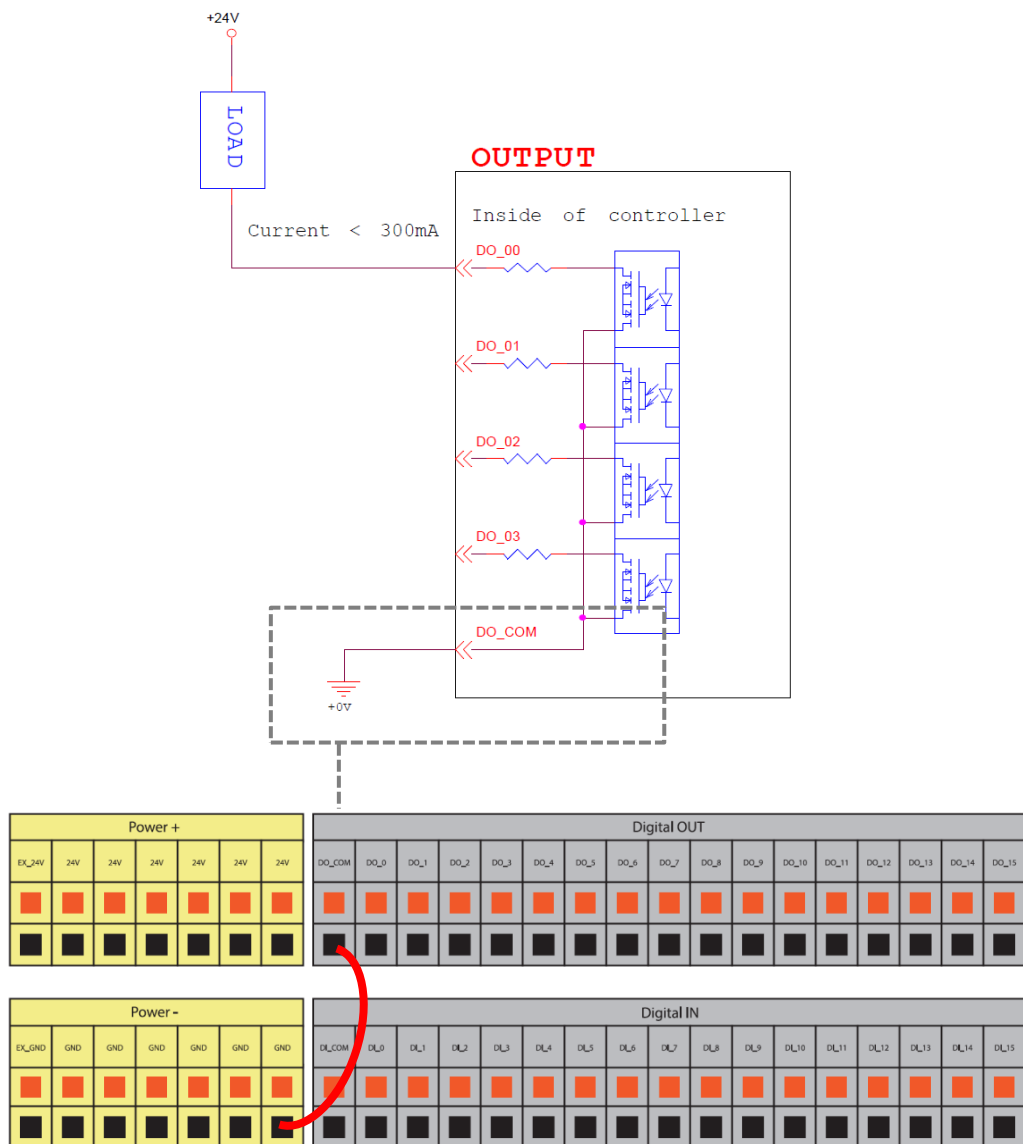


Figure 42: Set to Sink Output Type

- Set to source output type

Connect DO_COM terminal to the plus side of the power supply.

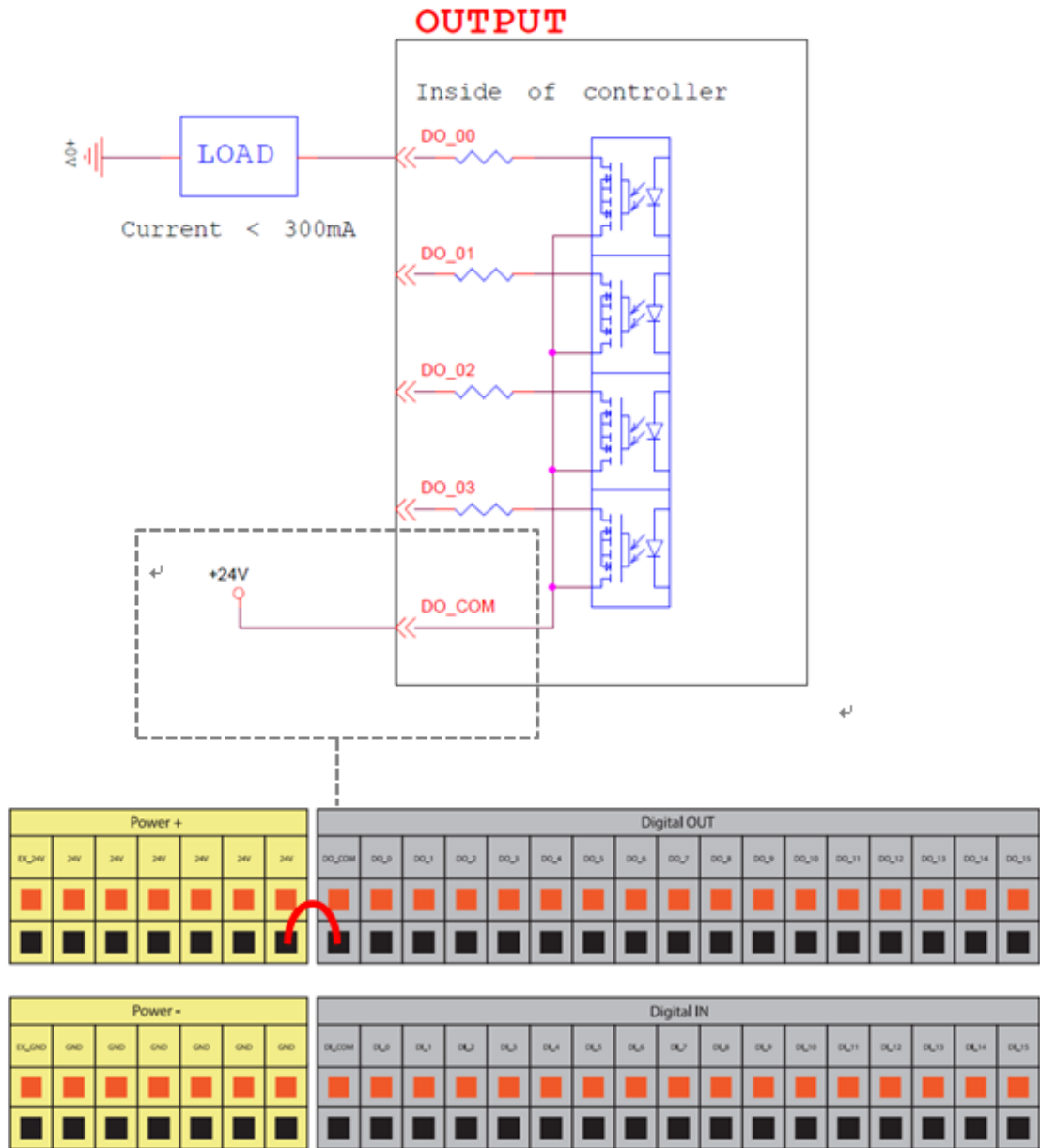


Figure 43: Set to Source Output Type

5.3.4 Analog In

Analog In only supports a voltage mode and detection range of -10.00 V ~ +10.00 V.

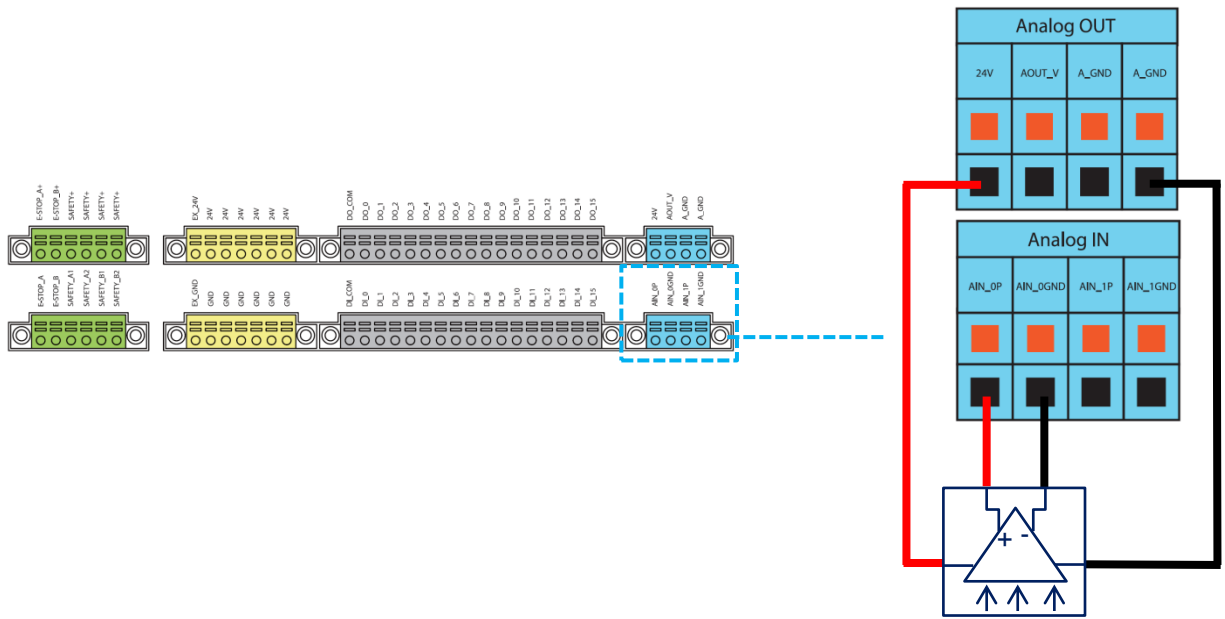


Figure 44: Analog In

5.3.5 Analog Out

Analog Out only supports a voltage mode and detection range of -10.00 V ~ +10.00 V.

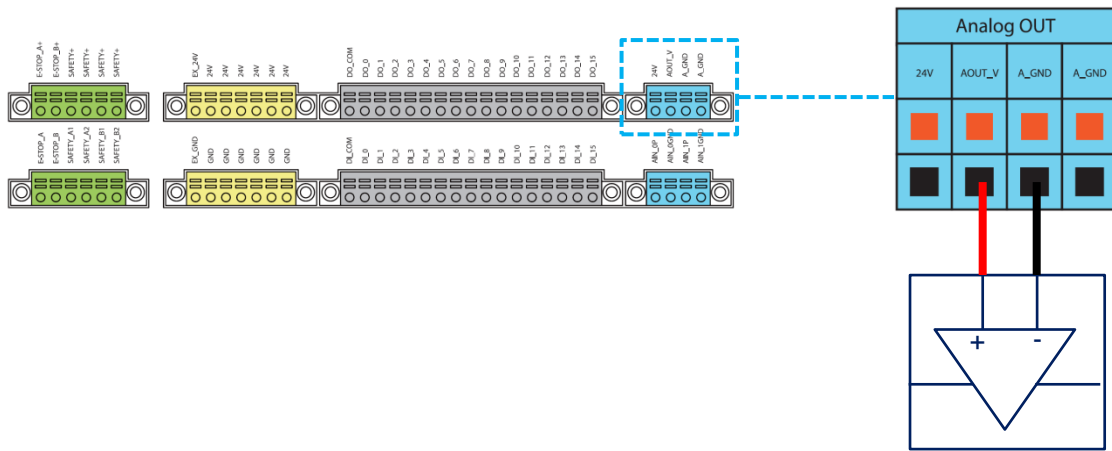
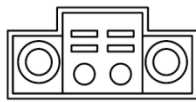


Figure 45: Analog Out

5.3.6 System Remote Power ON/OFF

The function of Remote ON/OFF shares the same functionality of the Robot Stick Power Button.



REMOTE ON/OFF

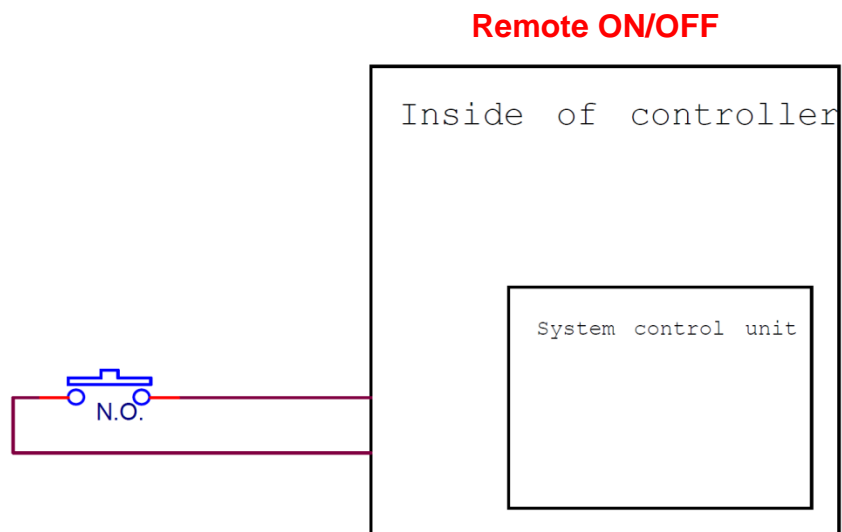


Figure 46: System Remote Power ON/OFF

5.3.7 EtherCAT: For EtherCAT Slave I/O Expansion



WARNING:

The robot must be powered off when installing the EtherCAT Slave. Do not plug or unplug the connector while the robot is on.

5.3.8 USB Port

The USB port of the control box is used for connecting the keyboard, mouse and external storage devices. External storage devices should only be used for the import/export functions of TMflow. No other device than those listed above should be connected. Be noted that the external storage device should be named “TMROBOT”.

5.4 Tool End I/O Interface

There are two small connectors on the tool end of the robot: The 8-pin connector is for digital I/O The 5-pin connector is for analog I/O..

5.4.1 I/O Terminals

The tool end 24V has a maximum output current of 1.5A. If overloaded, overload protection is activated and the robot will turn off the 24V output power.

Pin	Wire color	Pin define	
1	Brown	+24v	24V output
2	Red	DI_0	Digital Input0
3	Orange	DI_1	Digital Input1
4	Yellow	DI_2	Digital Input2
5	Green	DO_0	Digital Output0
6	Blue	DO_1	Digital Output1
7	Purple	DO_2	Digital Output2
8	Black	+0V	+0v

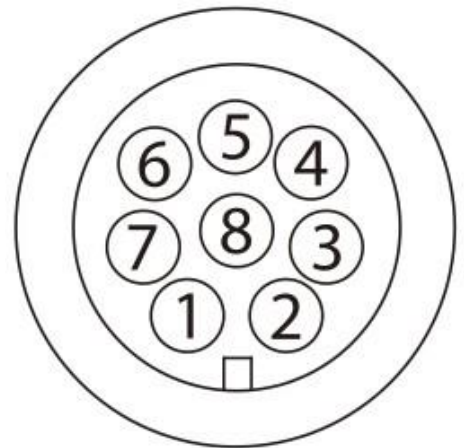


Table 8: 8-pin Digital I/O Connectors of Cable

Pin	Wire Color	Pin Define	
1	Brown	+24v	24V output
2	Red	DI_0	Digital input0
3	Orange	DI_1	Digital input1
4	Yellow	DI_2	Digital input2
5	Green	DO_0	Digital output0
6	Blue	DO_1	Digital output1
7	Purple	DO_2	Digital output2
8	Black	+0V	+0V



Table 9: 8-pin Digital I/O Connector of Robot

Pin	Wire Color	Pin Define	
1	Black	+24V	24V output
2	Brown	DI_3	Digital Input3
3	Red	DO_3	Digital Output3
4	Orange	AI Analog	Input
5	Yellow	+0V	GND

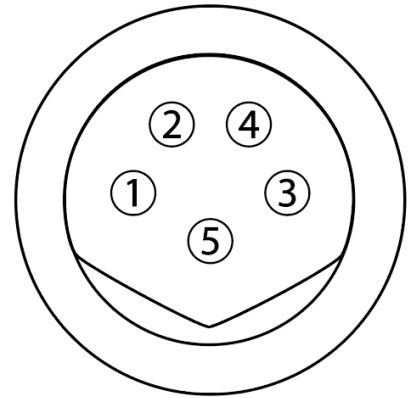


Table 10: 5-pin Analog I/O Connector of Cable

Pin	Wire Color	Pin Define	
1	Black	+24V	24V output
2	Brown	DI_3	Digital Input3
3	Red	DO_3	Digital Output3
4	Orange	AI Analog	Input
5	Yellow	+0V	GND

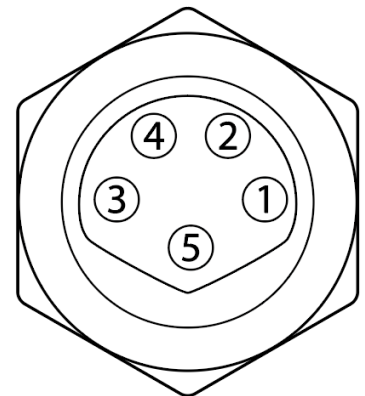


Table 11: 5-pin Analog I/O connector of Robot

5.4.2 Connecting Tool End Digital Output

The following figure shows how to connect the tool end digital output:

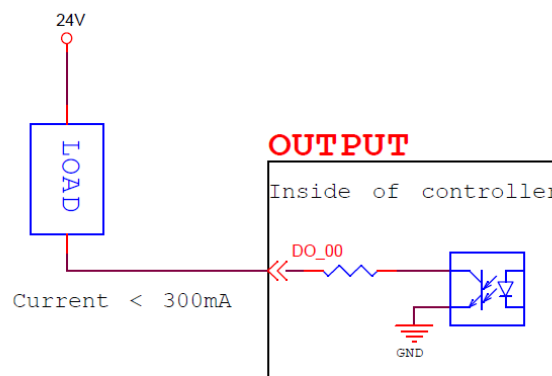


Figure 47: Connecting Tool End Digital Output

5.4.3 Connecting Tool End Digital Input

The following figure shows how to connect the tool end digital input:

NOTE: If sensors are connected directly then they should be NPN.

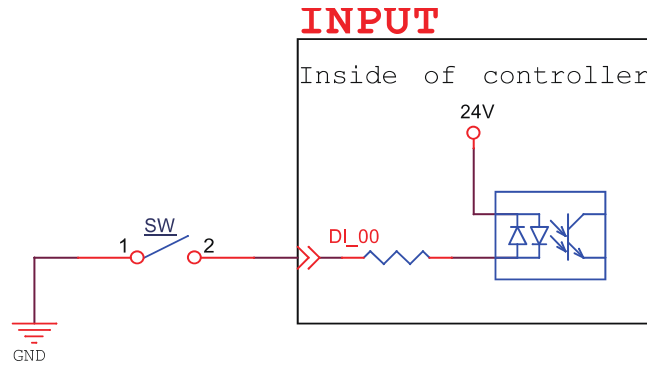


Figure 48: Connecting Tool End Digital Input

5.4.4 Connecting Tool End Analog Input

Input range of -10.00 V ~ +10.00 V.

The following figure shows how to connect the tool end Analog input:

(Because AIN_GND is connected to ground, when AIN is a dead contact, a pressure difference will occur, which is a normal phenomenon.)

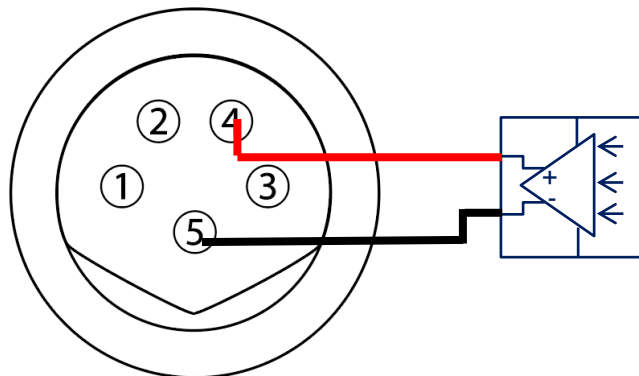


Figure 49: Connecting Tool End Analog Input

5.5 Control Box Interfaces

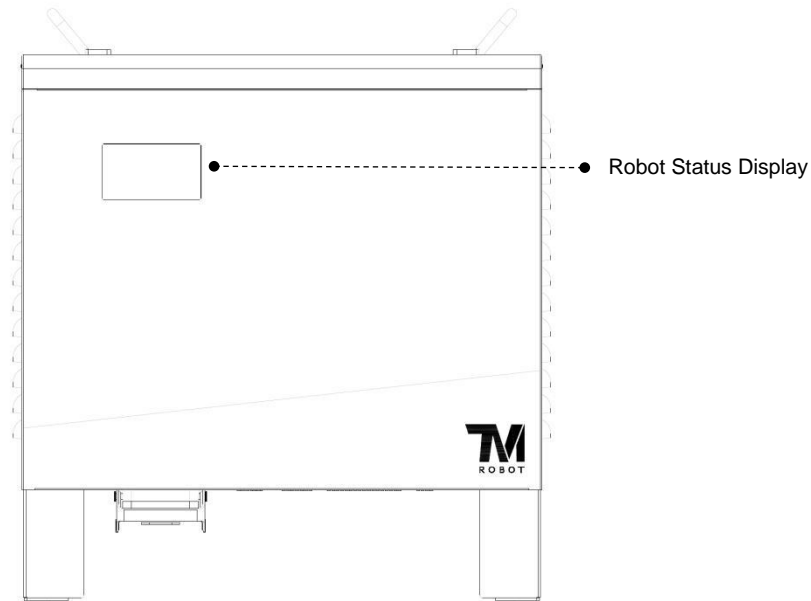


Figure 50: Front View of the Control Box



CAUTION:

The ETHERCAT interface can only be used to connect ETHERCAT devices. Improper connection may cause the robot to stop.

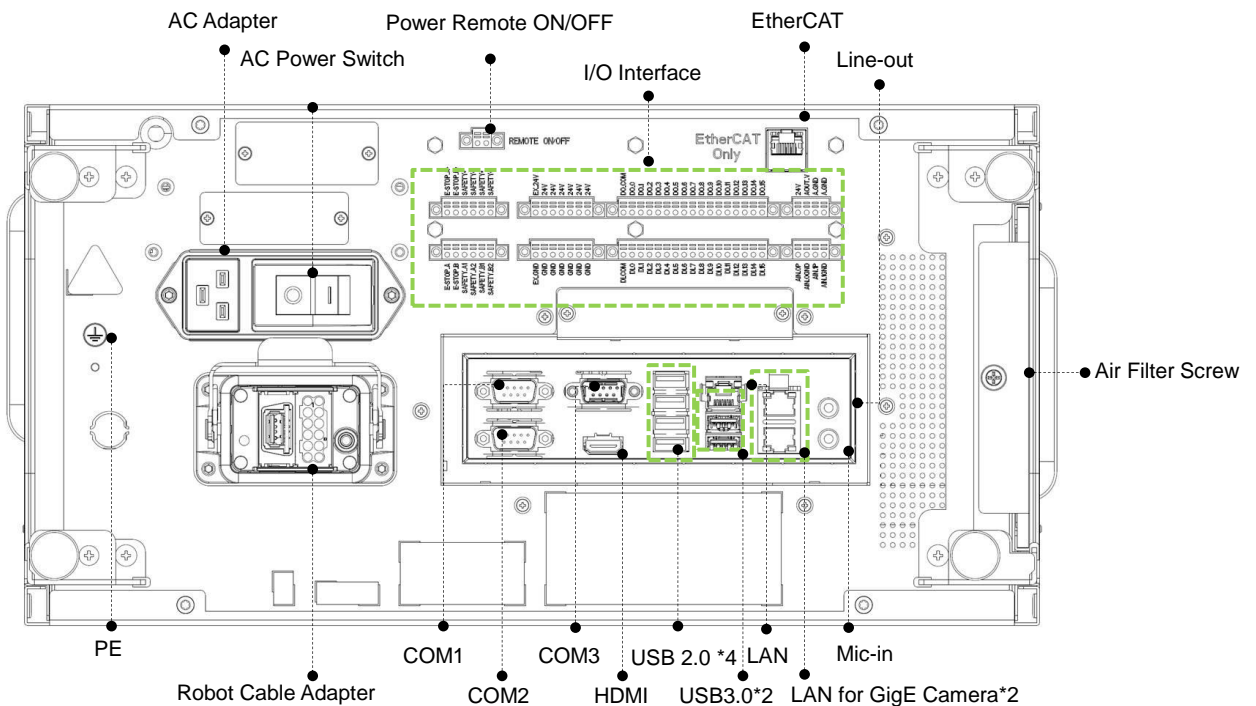


Figure 51: Interfaces of the TM5-700 / TM5X-700 / TM5-900 / TM5X-900 Series

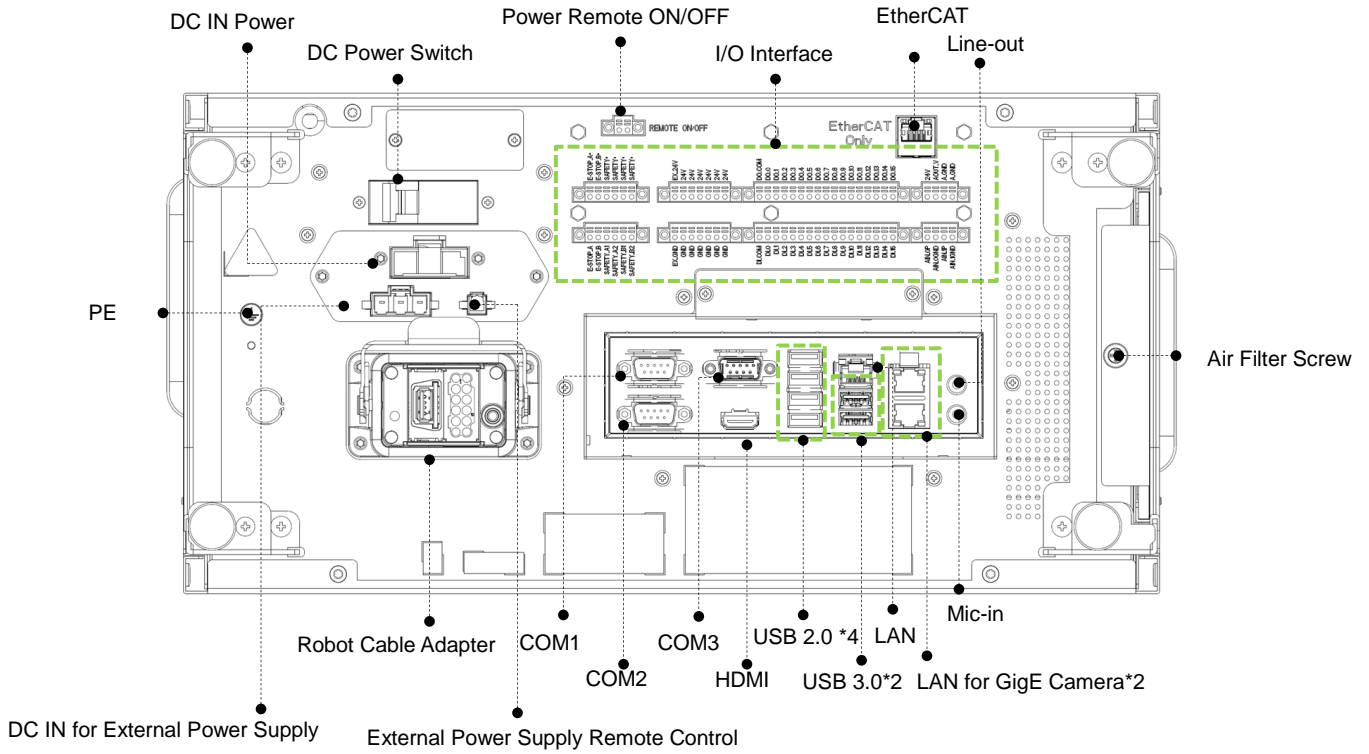


Figure 52: Interfaces of the TM5M-700 / TM5MX-700 / TM5M-900 / TM5MX-900 Series

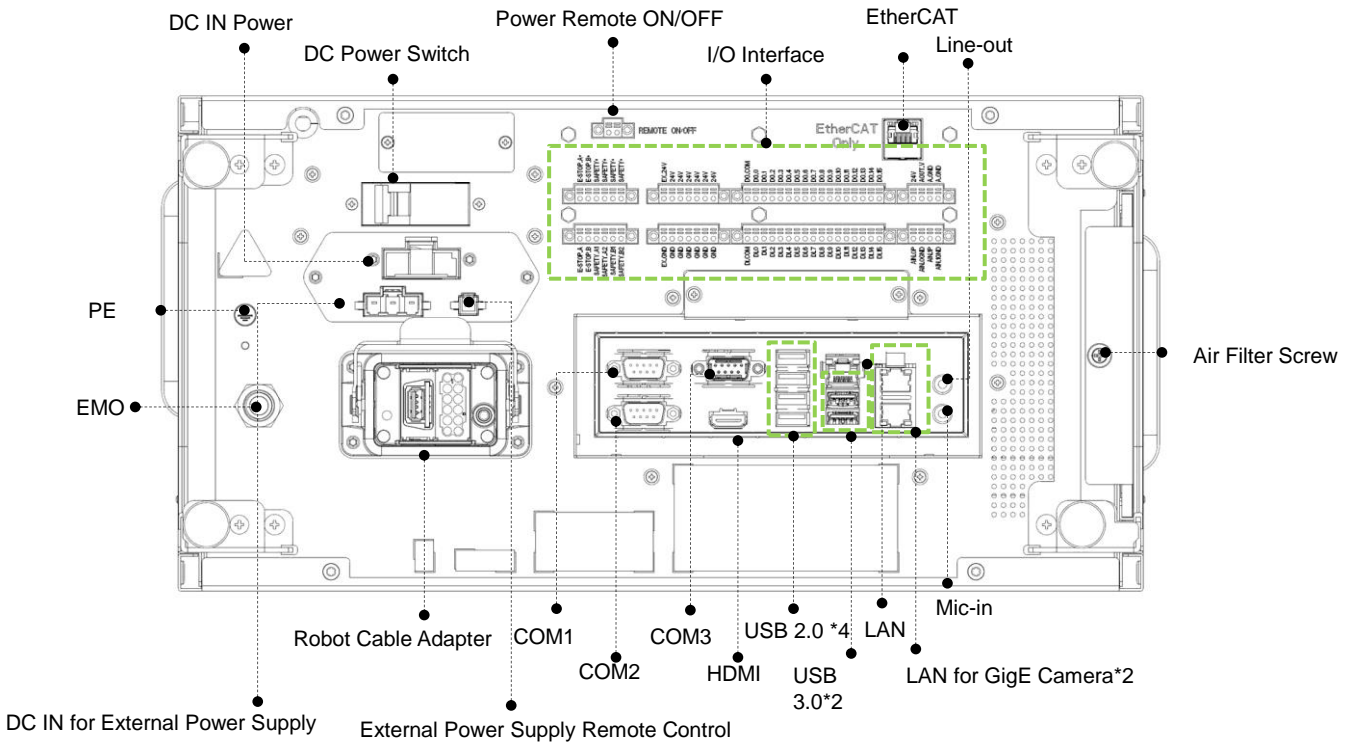


Figure 53: Interfaces of the TM5M-700 SEMI / TM5MX-700 SEMI / TM5M-900 SEMI / TM5MX-900 SEMI Series

5.5.1 SEMI Emergency OFF Box Interfaces (TM5-700 SEMI and TM5-900 SEMI exclusive)

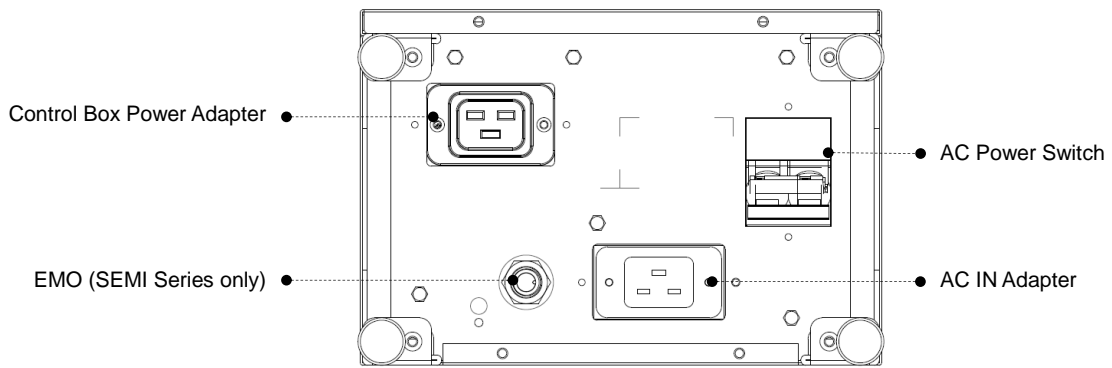


Figure 54: Interfaces of the SEMI Emergency OFF Box

5.6 Control Box Power Interface and Robot Interface

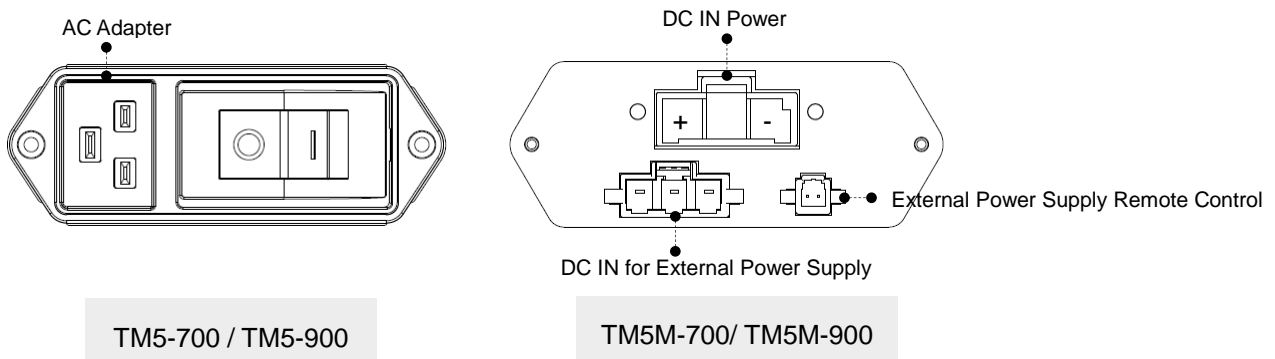
5.6.1 Control Box Power Interface

TM5-700 / TM5-900 / TM5X-700 / TM5X-900:

The power cable of the control box has an IEC plug. The local power plug is connected to the IEC plug.

TM5M-700/ TM5M-900:

The power cable of the control box has Hirose (HRS) DF60 series connector.



AC Adapter : IEC plug

DC IN Power Connector : (HRS) DF60-3EP-10.16C

DC IN for External Power Supply Connector : Contact the Corporation for purchasing

External Power Supply Remote Control Connector : Contact the Corporation for purchasing

Figure 55: Control Box Power Interfaces

The power supply should be equipped with the following:

- Grounding

- Main fuse
- Residual current device (RCD)

It is recommended to install a master switch on the equipment power supply for robot applications for servicing and inspection.

Parameters	Minimum value	Typical value	Maximum value	Unit
Input voltage	100	-	240	VAC
External mains fuse (100V~120V)	-	-	15	A
External mains fuse (220V~240V)	-	-	8	A
Input frequency	43	-	63	Hz

Table 12: TM5-700 / TM5-900 / TM5X-700 / TM5X-900 Electrical Specifications

Parameters	Minimum Value	Typical value	Maximum value	Unit
Input voltage	22	-	60	V (DC)
Power consumption		200	1500	W

Table 13: TM5M-700/ TM5M-900 Series Electrical Specifications

*If using DC22~47V power supply, the Robot will automatically limit the total output power



DANGER:

1. Ensure that the robot is correctly grounded (electrical grounding).
2. Ensure that the input current of the control box is protected by the Residual Current Device (RCD) and appropriate fuses.
3. Ensure that all cables are correctly connected before the control box is energized. Always use genuine power cables correctly.

5.6.2 Robot Interface

The following figure shows the connection interface of the robot. The cables of the robot are connected to the control box through the interface.

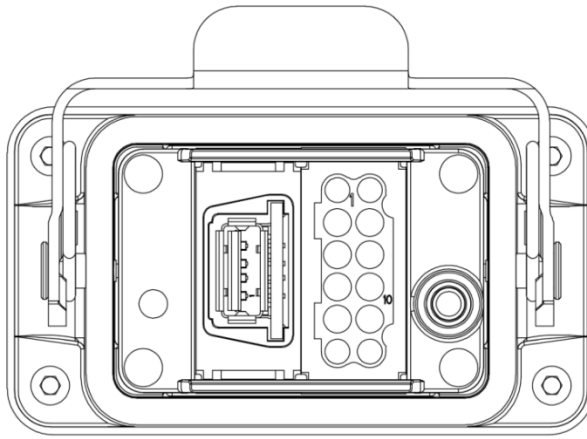


Figure 56: Robot Interface



WARNING:

1. When the robot is turned on, do not disconnect cables of the robot. When cables of the robot are not connected to the connection interface, do not turn on the robot.
2. Do not extend or modify the original cables of the robot.
3. The cables of the robot are only suitable for a fixed installation. If you require a flexible installation, contact the Corporation.

5.6.3 SEMI Emergency Off Interfaces (SEMI series exclusive)

Refer below for the SEMI Emergency Off interfaces. The SEMI Emergency Off switch is connected with control box through the EMO port. Please remove the padlock on the power interface for the power cable or the power switch, and secure the padlock back to the box with the screws for shipping the box.

5.6.3.1 TM5M-700 SEMI / TM5MX-700 SEMI / TM5M-900 SEMI / TM5MX-900 SEMI Series

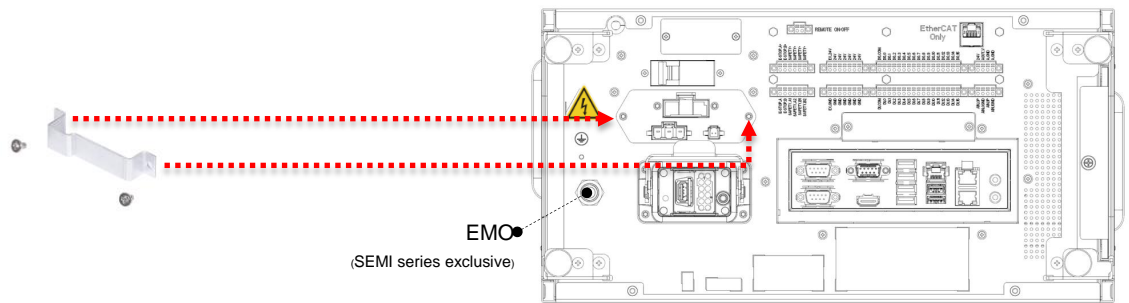


Figure 57: The TM5M-700 SEMI / TM5MX-700 SEMI / TM5M-900 SEMI / TM5MX-900 SEMI
SEMI Emergency Off Interface

5.6.3.2 The SEMI Emergency OFF Box

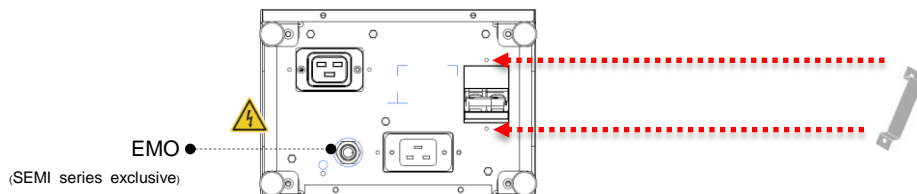


Figure 58: The SEMI Emergency OFF Box
SEMI Emergency Off Interface



CAUTION:

For SEMI series, when SEMI Emergency Off Switch is not connected with EMO, the TM Robot cannot be booted.



WARNING:

When SEMI Emergency Off Switch is pressed, all power will be cut off immediately.

6. Unboxing & Installation

6.1 Overview

These instructions guide the user of the TM Robot through the first set up. The user must thoroughly read and understand this Guide before performing the operations of this Chapter. Fail to do so may cause serious danger.



WARNING:

If this is your first time using the TM Robot, follow instructions in this chapter to perform installation and initial set up. If the robot has been implemented in the working environment, please note the following:

1. To avoid potential hazards after changing the original environment setting, verify with current responsible operator and to back up all necessary software settings and hardware wirings scheme.
2. Remove all of the control box's external I/O connections including the analog I/O, EtherCAT port and network port. Remove all air lines or external power lines connected to the optional equipment before Commissioning.
3. Remove all of the control box's connections to external devices / external storage devices through USB interface, Serial port, and network interface.
4. Unload any object/end effector attached to the end flange, and any electrical connection between the end effector and end module / control box of the robot.
5. Unload any hardware attached to the robot arm.

6.2 Inspecting the Equipment

6.2.1 Before Unpacking

Carefully inspect all shipping crates for evidence of damage during transit. If any damage is indicated, request that the carrier's agent be present at the time the container is unpacked

6.2.2 Upon Unpacking

Before signing the carrier's delivery sheet, compare the actual items received (not just the packing slip) with your equipment purchase order and verify that all items are present and that the shipment is correct and free of visible damage,

If the items received do not match the packing slip. or are damaged, do not sign the receipt. Contact your corporation support as soon as possible.

If the items received do not match your order, contact your corporation support immediately. Inspect each item for external damage as it is removed from its container. If any damage is evident, contact your corporation support (see HOW Can I Get Help? on 1.2)

Retain all shipping containers and packaging materials. These items may be necessary to settle claims or at a later date, to relocate equipment.

6.3 Unboxing

6.3.1 Carton Types

The TM Robot product comes with 2 cartons: the robot arm carton, and the control box carton, as shown below. Also, a SEMI Emergency OFF switch carton will come along with the SEMI series. For TM5-700 SEMI or TM5-900 SEMI, there will be an additional carton comes with the SEMI Emergency OFF Box. Refer below for the ratio of the cartons. The actual sizes of the cartons may differ from measurements



Figure 59: Robot Arm Carton



Figure 61: Control Box Carton



Figure 60: SEMI Emergency OFF Switch Carton



Figure 62: SEMI Emergency OFF Box Carton

6.3.2 Contents of Each Carton

Each carton has the following contents. Check them when you unpack the cartons for the first time. If any item is missing, contact your vendor.

The robot arm carton contains:


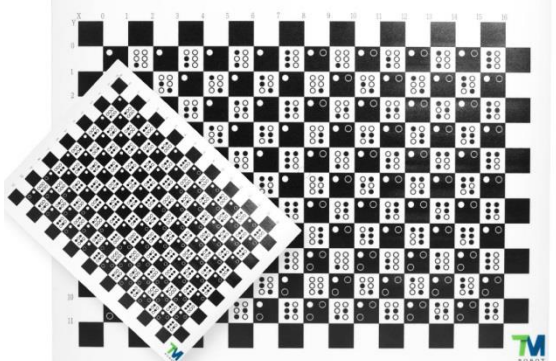
	<p>Robot arm</p> <p>Cable length: 300 cm</p>
---	---

Table 14: The Robot Arm Carton Contents

The control box carton contains:

	<p>Control box</p>
	<p>Calibration Plates</p> <p>(Contains one large and one small calibration plate)</p> <p>*The Calibration Plate comes only with TM Robots fitted with the hand-eye camera. No Calibration Plate includes in the following series:</p> <p>TM5X-700 / TM5X-900</p>


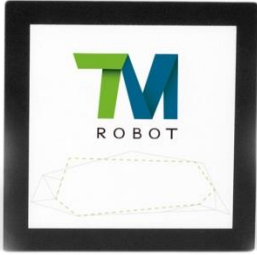



	<p style="text-align: center;">IO cables</p> <p>(2 packs) 8-pin digital I/O, 5-pin analog I/O Cable length: 100 cm</p>
	<p style="text-align: center;">TM Landmark</p> <p>(Contains two TM Landmark) *The TM Landmark comes only with TM robots fitted with the hand-eye camera. No TM Landmark includes in the following series: TM5X-700 / TM5X-900</p>
	<p style="text-align: center;">Power cord of the control box (TM5-700 / TM5-900 / TM5X-700 / TM5X-900)</p> <p>(1 cable) Cable length: 180 cm * Exact delivery of power plug will vary from regions to regions.</p>
	<p style="text-align: center;">Power cable of the control box (TM5M-700 / TM5M-900)</p> <p>(1 cable) Cable length: 120 cm</p>
	<p style="text-align: center;">Ground Wire</p> <p>(1 pack) Cable length: 300 cm</p>

Table 15: The Control Box Carton Contents

The SEMI Emergency OFF Switch carton contains:


	<p>SEMI Emergency OFF Switch (SEMI series exclusive)</p> <p>(1 pack)</p> <p>Cable length: 300 cm</p>
---	--

Table 16: The SEMI Emergency OFF Switch Carton Contents

The SEMI Emergency OFF Box carton contains:

	<p>SEMI Emergency OFF Box</p>
	<p>Power extension cord of SEMI Emergency OFF Box</p> <p>(1 cable)</p> <p>Cable length: 180 cm</p> <p>* Use the power extension cord of the SEMI Emergency OFF Box to connect between the control box and the SEMI Emergency OFF Box.</p>

Table 17: The SEMI Emergency OFF Box Carton Contents

6.4 Installing Your Robot

The TM Robot arm cannot stand independently after being removed from the carton. Therefore, prepare the mounting base with the corresponding holes as described in 4.2.1.6 Robot Arm Installation, and follow the instructions below to install the robot.

**WARNING:**

At the installation site, at least two people should simultaneously perform installation of the robot; otherwise you risk robot arm damage or personal injury. Do not install the robot alone.

**WARNING:**

Do not attempt to move any robot links until the robot has been secured in position. Failure to comply could result in the robot falling and causing either personnel injury or equipment damage.

6.4.1 Remove the Control Box

After checking the contents, remove the contents in order and perform installation.

Control box carton:

- Remove the Calibration Plates and TM Landmark
- Remove the power cable of the control box
- Remove the control box (At least two people should remove the control box from the carton. Refer the figure below for the correct holding positions.)
- Connect the power cable to the control box
- Place the control box near the robot base



Figure 63: Moving the Control Box (1/2)

The control box should be carried by at least two people. One should hold on to the control box handles, while the other should carry the foot stands. Before handling, the cable of the robot stick should not be pulled to avoid any performance degradation.



Figure 64: Moving the Control Box (2/2)



WARNING:

At this stage, do not connect the power cable of the control box to any electrical outlet, or it may cause equipment damage.

6.4.2 Verification Before Removal of the Robot Arm

The TM Robot arm cannot stand independently after being removed from the carton. Prepare four screws (M10 *4) that used to attach the robot to the base near the robot base in advance. If the base is designed with corresponding pinholes, mount them to the base.

6.4.3 Removal of the Robot Arm and Tightening

At least two people should remove the robot arm from the carton. For the correct holding positions, see the figure shown below. Place the robot on the mounting base. If it is designed with connection pins, align the pinholes of the robot base module. Tighten two locking screws with metal washers for the robot base that are diagonally across from each other, and then tighten the other two locking screws.

Follow the tightening torque recommended in 4.2.1.6 Robot Arm Installation



Figure 65: Moving the Robot Arm (1/2)

The Robot Arm itself should be handled with at least two people. One person should carry the Lower arm and Upper arm, and the other should hold on to the position between the base and 1st Joint as well as the 6th Joint. Before the Robot Base is fastened with screws tightly, the Robot Arm should always be supported to avoid tipping.



Figure 66: Moving the Robot Arm (2/2)



WARNING:

When the robot is installed to the base, make sure two people work together to install it. If it is designed with pinholes, pay attention to your safety to avoid pinching. If you do not have connection parts at hand, such as the connecting pins and screws, do not leave the robot without completely tightening it (with the 4 screws completely tightened). One person should continuously support the robot arm while the other person goes to get required parts. Otherwise, the robot arm may tip, result in equipment damage or personal injury.

6.4.4 Connect the Robot and the Control Box

1. Connect the cable from the robot to the robot interface of the control box.
2. Connect the power cable between the wall socket and the power interface of the control box.

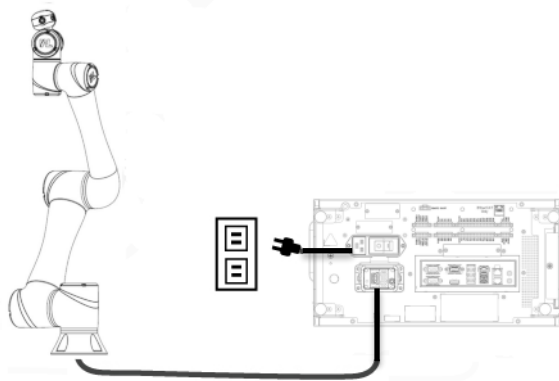


Figure 67: Connecting the Robot and the Control Box

For the SEMI series users only, connect the SEMI Emergency OFF switch to the EMO interface of the control box.

6.4.4.1 Connect the Robot, the Control Box, and the SEMI Emergency OFF Box

For users of TM5-700 SEMI or TM5-900 SEMI exclusively:

1. Connect the cable from the robot to the robot interface of the control box
2. Connect the power extension cord between the control box and the SEMI Emergency OFF box.
3. Connect the SEMI Emergency OFF Switch to the EMO interface of the SEMI Emergency OFF Box.
4. Connect the power cable between the wall socket and the power interface of the SEMI Emergency OFF Box.

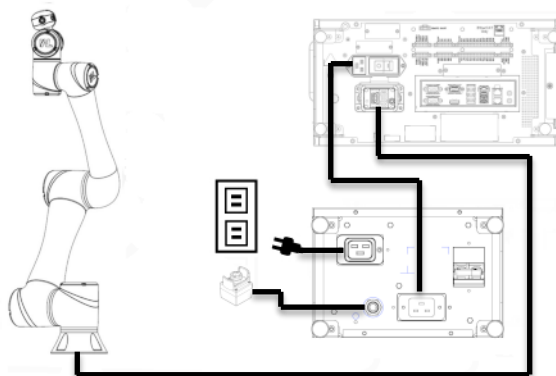


Figure 68: Connecting the Robot, the Control Box, and the SEMI Emergency OFF Box

**WARNING:**

1. Ensure that all cables are correctly connected before the control box is energized. Always use genuine power cables correctly.
2. When the robot is turned on, do not disconnect cables of the robot. When cables of the robot are not connected to the connection interface, do not turn on the robot.
3. Do not extend or modify the original cables of the robot.

7. Maintenance and Repair

The following table gives a summary of the preventive maintenance procedures and guidelines:

Items	Period	Remark
Warning, Safety labels	1 week	Ensure labels are present and legible. Replace them if necessary.
Check Filter	1 month	Replace filter every 3 months.
Check Emergency Switch	1 month	Press the Emergency Switch and the IO E-Stop in open-loop status. Verify that each shuts off power.
Check Safeguard Ports (A, B)	1 month	When the Safeguard A Port is in the open-loop state, the indication light of current mode will be constantly flashing. When the Safeguard B Port is in the open-loop state, the purple light will be alternating between the indication light of the current mode.
Check Robot Mounting Screws	3 months	Follow "4.2.1.6 Robot Arm Installation"
EMO button (SEMI version only)	6 months	Press the EMO button. Verify that power shuts off.

Table 18: Summary of the Preventive Maintenance Procedures and Guidelines

Only the legal distributor or authorized service center should repair the TM Robot. Users should not repair it by themselves.



DANGER:

Before performing maintenance or service record the details of each setting for the robot for normal operation. Make sure that each setting satisfies the original conditions before resuming normal operation, including but not limited to:

- Safety Software Settings
- Safety I/O
- Preset operation project
- TCP Settings
- I/O Settings
- I/O Wiring

8. Warranty Statement

8.1 Product Warranty

The user (customer) may make a request to his/her dealer and retailer within any reasonable situation. The manufacturer will provide warranty under the following conditions:

During the first twelve months of the warranty period (no more than 15 months from the date of shipment), The Corporation will provide necessary spares for malfunctioned parts of new equipment due to production and manufacture error or damage. If the user (customer) has to bear labor costs, a new or refurbished part can be used for servicing. If equipment defects are caused by improper handling or failure to comply with manual requirements, this guarantee is invalid. Warranty services do not cover operations conducted by the dealer or user, such as arm installation, software download. Your warranty request must be made two months before the warranty is expired. All replaced or returned items are the property of the Corporation. This warranty does not cover other requests directly or indirectly related to equipment. No conditions of this warranty shall attempt to limit or exclude customer's statutory rights or manufacturer's responsibility for personal injury or death due to negligence. The warranty cannot be extended, even if it is the initial warranty. The Corporation reserves the right to charge customers for replacement or service costs, as long as no warranty terms are violated.

The above-mentioned rules shall not imply a change in the burden of proof to the detriment of the interests of customers. When equipment becomes defective, we are not liable for compensation for any indirect, incidental, special, or corresponding damage, including but not limited to profit loss, loss of use, production loss or other production equipment damage.

8.2 Disclaimer

The Corporation will continuously improve the reliability and performance of the product. Therefore, we reserve the right to upgrade the product without prior notice. The Corporation has verified the accuracy and correctness of this Manual but will not liable for any erroneous or omitted information.

9. Certificates





CERTIFICATE OF COMPLIANCE

Certificate No. MDC 2155

SGS Reference:	CST262642/1		
Date of Issue:	25 th January 2019	Issue No.:	1
Client/Applicant:	TECHMAN ROBOT Inc. 4F, No. 188, Wenhua 2nd Rd. Guishan Dist., Taoyuan City, Taiwan		
Manufacturer:	Same as above		
Scope of certification:	Full technical file assessment according to Machinery Directive 2006/42/EC, ISO 12100:2010, EN 60204-1:2006/AC:2010, EN ISO 13849-1:2015, EN ISO 10218-1:2011 and ISO/TS 15066:2016		
Description of Equipment	Industrial Robot		
Type/Series:	TM5-700, TM5M-700, TM5X-700, TM5MX-700, TM5-700 SEMI, TM5M-700 SEMI, TM5X-700 SEMI, TM5MX-700 SEMI, TM5-900, TM5M-900, TM5X-900, TM5MX-900, TM5-900 SEMI, TM5M-900 SEMI, TM5X-900 SEMI, TM5MX-900 SEMI, TM12, TM12M, TM12X, TM12MX, TM12 SEMI, TM12M SEMI, TM12X SEMI, TM12MX SEMI, TM14, TM14M, TM14X, TM14MX, TM14 SEMI, TM14M SEMI, TM14X SEMI, TM14MX SEMI		
Safety System Revision:	TECHMAN ROBOT Safety System 3.0		
Serial Number(s):	N/A		
Trade Mark/Name:	TECHMAN ROBOT		
Assessment Performed:	Assessed for compliance with the requirements of the Machinery Directive 2006/42/EC, ISO 12100:2010, EN 60204-1:2006/AC:2010, EN ISO 13849-1:2015, EN ISO 10218-1:2011 and ISO/TS 15066/2016		
Conclusion:	In the opinion of SGS United Kingdom Limited the industrial robot types listed above are compliant to the requirements of the of the Machinery Directive 2006/42/EC, and the submitted technical file referenced as CST262642/1 is compliant to the requirements of Annex VII of the Machinery Directive 2006/42/EC.		
Authorised Signature	 Daniele Paoli Machinery Manager		

Page 1 of 1

The CE mark as shown below can be used after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives.



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MD 38 Iss 03 - 02/09/2016

SGSPAPER
19356505





SGS Reference No: MH/2018/50140C

VERIFICATION OF EMC COMPLIANCE

Verification No. : MH/2018/50140C
Representative Model No. : TM14M
Added Model(s) : TM5M-700, TM5MX-700, TM5M-900, TM5MX-900,
TM5M-700 SEMI, TM5MX-700 SEMI, TM5M-900 SEMI,
TM5MX-900 SEMI, TM12M, TM12MX, TM14M, TM14MX,
TM12M SEMI, TM12MX SEMI, TM14M SEMI, TM14MX SEMI
Product Name : Industrial Robot
Brand Name : Techman Robot Inc.
Applicant : Techman Robot Inc.
Address of Applicant : 4F, No. 188, Wenhua 2nd Rd. Guishan Dist., Taoyuan City, Taiwan
Test Report Number : MH/2018/50140
Date of Issue : Aug. 06, 2018
Applicable Standards : EN 61000-6-4 : 2007+A1:2011
EN 61000-6-2 : 2017
IEC 61000-4-2 : 2008, IEC 61000-4-3 : 2006+A1:2007+A2:2010
IEC 61000-4-4 : 2012, IEC 61000-4-5 : 2014
IEC 61000-4-6 : 2013, IEC 61000-4-8 : 2009

Conclusion

The apparatus meets the requirements of the above standards. In addition, this verification is only valid for the equipment and configuration described and in conjunction with the test report as detailed above.

Authorized Signatory:

SGS TAIWAN LTD.
Eddy Cheng
Technical Asst. Supervisor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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SGS Taiwan Ltd.

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Member of SGS Group



SGS Reference No: MH/2018/30017C

VERIFICATION OF EMC COMPLIANCE

Verification No. : MH/2018/30017C
Representative Model No. : TM12
Added Model(s) : TM5-700; TM5X-700; TM5-900; TM5X-900; TM5-700 SEMI; TM5X-700 SEMI; TM5-900 SEMI; TM5X-900 SEMI; TM12; TM12X; TM14; TM14X; TM12 SEMI; TM12X SEMI; TM14 SEMI; TM14X SEMI
Product Name : Industrial Robot
Brand Name : TECHMAN ROBOT INC
Applicant : Techman Robot Inc.
Address of Applicant : 4F, No. 188, Wenhua 2nd Rd. Guishan Dist., Taoyuan City, Taiwan
Test Report Number : MH/2018/30017
Date of Issue : May 02, 2018
Applicable Standards : EN 61000-6-4 : 2007+A1:2011
EN 61000-6-2 : 2005+AC:2005
IEC 61000-4-2 : 2008, IEC 61000-4-3 : 2006+A1:2007+A2:2010
IEC 61000-4-4 : 2012, IEC 61000-4-5 : 2014
IEC 61000-4-6 : 2013, IEC 61000-4-8 : 2009, IEC 61000-4-11 : 2004

Conclusion

The apparatus meets the requirements of the above standards. In addition, this verification is only valid for the equipment and configuration described and in conjunction with the test report as detailed above.

Authorized Signatory:

SGS TAIWAN LTD.
Eddy Cheng
Technical Asst. Supervisor

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台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DECLARATION OF INCORPORATION

We **TECHMAN ROBOT Inc.**
4F, No. 188, Wenhua 2nd Rd. Guishan Dist., Taoyuan City, Taiwan

Declare that the
Product name: Industrial Robot

Series Model Number:

TM5-700; TM5M-700; TM5X-700; TM5MX-700; TM5-900; TM5M-900; TM5X-900; TM5MX-900;
TM5-700 SEMI; TM5M-700 SEMI; TM5X-700 SEMI; TM5MX-700 SEMI; TM5-900 SEMI;
TM5M-900 SEMI; TM5X-900 SEMI; TM5MX-900 SEMI;
TM12; TM12M; TM12X; TM12MX; TM14; TM14M; TM14X; TM14MX;
TM12 SEMI; TM12M SEMI; TM12X SEMI; TM12MX SEMI; TM14 SEMI; TM14M SEMI; TM14X SEMI; TM14MX SEMI;

Conform to the essential safety requirements of the relevant European Directive:

- Machinery Directive 2006/42/EC
- Electromagnetic Compatibility Directive 2014/30/EU
- Low Voltage Directive 2014/35/EU

The following essential requirements of EC Machinery Directive 2006/42/EC have been applied:

Clause 1.1.2, 1.1.3, 1.1.5, 1.1.6, 1.1.7, 1.2.1, 1.2.2, 1.2.3, 1.2.4.1, 1.2.4.2, 1.2.4.3, 1.2.4.4, 1.2.5, 1.2.6, 1.3.1, 1.3.2,
1.3.4, 1.3.6, 1.3.7, 1.3.8.1, 1.3.8.2, 1.3.9, 1.4.1, 1.4.2.1, 1.4.3, 1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.5.13, 1.5.14, 1.6.1,
1.6.2, 1.6.3, 1.6.4, 1.6.5, 1.7.1.1, 1.7.1.2, 1.7.2, 1.7.3, 1.7.4, 1.7.4.1, 1.7.4.2, 1.7.4.3

The person who compile technical file established within the EU:

Name: SGS UK

Address: SGS United Kingdom Rossmore Business Park, Ellesmere Port, Cheshire CH65 3EN

Mounting and connecting instructions defined in catalogues and technical construction files must be respected by the user.

They are based on the following standards :

- EN ISO 12100: 2010 / Safety of Machinery - General principles for design / Risk Assessment and Risk reduction.
- EN 60204-1:2006/AC:2010 / Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- EN ISO 13849-1:2015 / Safety of machinery - Safety-related parts of control systems Part 1: General principles for design
- EN ISO 10218-1:2011 / Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots
- ISO TS 15066-2016 / Robots and robotic devices — Collaborative robots
- EN 61000-6-2:2005 / Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
- EN 61000-6-4:2007/ A1:2011 / Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments.

The relevant technical documentation has been compiled in accordance with Annex VII, Part B of EC Machinery Directive 2006/42/EC. We undertake, in response to a reasoned request, to supply it to the market surveillance authorities within a reasonable period.

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive.

Authorized Signature :
Name : Haw Chen
Responsibility : CEO
Date : April 25, 2018
Place : Taiwan



Appendix A. Technical Specifications

Model		TM5-700	TM5-900	TM5X-700	TM5X-900	TM5M-700	TM5M-900
Weight		22.1 kg	22.6 kg	21.8 kg	22.3 kg	22.1 kg	22.6 kg
Maximum Payload		6 kg	4 kg	6 kg	4 kg	6 kg	4 kg
Reach		700 mm	900 mm	700 mm	900 mm	700 mm	900 mm
Typical Speed		1.1 m/s	1.4 m/s	1.1 m/s	1.4 m/s	1.1 m/s	1.4 m/s
Joint ranges	J1,J6	+/- 270°	+/- 270°	+/- 360°	+/- 360°	+/- 270°	+/- 270°
	J2,J4,J5	+/- 180°	+/- 180°	+/- 360°	+/- 360°	+/- 180°	+/- 180°
	J3	+/- 155°					
Speed	J1~J3	180°/s					
	J4~J6	225°/s					
Repeatability		+/- 0.05 mm					
Degrees of freedom		6 rotating joints					
I/O ports		Control box			Tool conn.		
	Digital in	16			4		
	Digital out	16			4		
	Analog in	2			1		
	Analog out	1			0		
I/O power supply		24V 1.5A for control box and 24V 1.5A for tool					
IP classification		IP54 (Robot Arm); IP32 (Control Box)					
Power consumption		Typical 220 watts					
Temperature		The robot can work in a temperature range of 0-50°C					
Power supply		100-240 VAC, 50-60 Hz				DC22~60VDC	
I/O Interface		3×COM, 1×HDMI, 3×LAN, 4×USB2.0, 2×USB3.0					
Communication		RS232, Ethernet, Modbus TCP/RTU (master & slave)					
Programming Environment		TMflow, flowchart based					
Certification		CE, SEMI S2 (optional)					
Robot Vision							
Eye in Hand (Built in)		1.2M/5M pixels, color camera		N/A		1.2M/5M pixels, color camera	
Eye to Hand (Optional)		Support Maximum 2 GigE cameras					

Table 19: Technical Specifications

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